102d Congress, 1st Session - - - - - - - - - - - House Document 102-156

CANAVERAL HARBOR, BREVARD COUNTY, FLORIDA

COMMUNICATION

FROM

THE ASSISTANT SECRETARY OF THE ARMY FOR CIVIL WORKS

TRANSMITTING

A REPORT DATED JULY 24, 1991, FROM THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY, ON CANAVERAL HARBOR, BREVARD COUNTY, FLORIDA, TOGETHER WITH OTHER PERTINENT REPORTS AND COMMENTS, PURSUANT TO PUB. L. 89-789, SEC. 209 (80 STAT. 1423)

OCTOBER 21, 1991.—Referred to the Committee on Public Works and Transportation and ordered to be printed.

U.S. GOVERNMENT PRINTING OFFICE
48-001 WASHINGTON : 1991

H640-5

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LETTER OF TRANSMITTAL

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON DC 20310-0103

REPLY TO
ATTENTION OF

10 OCT 1991

Honorable Thomas S. Foley
Speaker of the House
of Representatives
Washington, D. C. 20515

Dear Mr. Speaker:

The Secretary of the Army hereby recommends Congressional authorization of modifications to the deep-draft navigation project for Canaveral Harbor, Brevard County, Florida. The proposal is described in the report dated July 24, 1991, from the Chief of Engineers which includes other pertinent reports and comments. These reports are in final response to resolutions of the Committees on Public Works of both the United States Senate and House of Representatives, adopted April 1, 1969 and December 11, 1969, respectively.

The views of the State of Florida, the Departments of the Interior and Transportation, and the Environmental Protection Agency are set forth in the enclosed communications.

The project would provide for increasing the authorized depth of the entrance channel from 37 to 41 feet, and deepening of the inner channel from 36 to 40 feet and widening it to 400 feet. An irregular area in the middle turning basin would be deepened from 35 to 39 feet to provide for a 1,200-foot-diameter turning area. Also included, is the deepening of the north branch channel from 35 feet to 39 feet with a width of 350 feet, and the deepening of the first 1,800 feet of the west access channel from 31 to 39 feet. Facilities for access and fishing are also included at the south jetty.

The report of the Chief of Engineers also proposed construction of a park adjacent to a shallow-draft navigation lock which connects the Canaveral Harbor with the Atlantic Intracoastal Waterway. The Secretary does not recommend Federal participation in this park since the facilities are the type normally provided by non-Federal interests and the park is an extension of an existing county boat ramp/mini-park located adjacent to the lock. The park is not an essential element of the deep-draft navigation project.

The total first cost of the recommended project, excluding the lock park, is $11,387,000 with an estimated Federal cost of $6,197,000, and an estimated non-Federal cost of $5,190,000.

The Office of Management and Budget advises that there is no objection to the submission of the report to the Congress. The project as modified by the Secretary of the Army is consistent with the program of the President. A copy of its letter is enclosed in the report.

Sincerely,

Nancy P Dorn

Nancy P. Dorn
Assistant Secretary of the Army
(Civil Works)

Enclosure

COMMENTS OF THE OFFICE OF MANAGEMENT AND BUDGET

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

AUG 2 8 1991

Honorable Nancy P. Dorn
Assistant Secretary of
the Army (Civil Works)
Room 2E570 - Pentagon
Washington, D.C. 20310-0103

Dear Ms. Dorn:

We have completed our review of the Navigation Study for Canaveral Harbor, Florida, as required under Executive Order 12322.

The Office of Management and Budget does not object to your submission of this report to Congress. The project as recommended in the report of the Chief of Engineers and modified by the Secretary of the Army is consistent with the program of the President, contingent upon project authorization and funding in accordance with cost-sharing provisions of P.L. 99-662.

Sincerely,

Robert E. Grady
Associate Director
for Natural Resources,
Energy and Science

COMMENTS OF THE STATE OF FLORIDA

STATE OF FLORIDA
Office of the Governor
THE CAPITOL
TALLAHASSEE, FLORIDA 32399-0001

LAWTON CHILES
GOVERNOR

January 19, 1991

Mr. Donald A. Banashek
Washington Level Review Center
Department of the Army
Corps of Engineers, Water Resources Support Center
ATTN: CEWRC-WLR-I
Kingman Building
Fort Belvoir, Virginia 22060-5576

RE: Canaveral Harbor Navigation Study--Final Feasibility Report and Environmental Impact Statement

SAI: FL9006271708CR

Dear Mr. Banashek:

The Florida State Clearinghouse, pursuant to Presidential Executive Order 12372, Gubernatorial Executive Order 83-150, the Coastal Zone Management Act and the National Environmental Policy Act, has coordinated a review of the above referenced project. Pursuant to Presidential Executive Order 12372, the project is in accord with State plans, programs, procedures and objectives.

The State has reviewed your federal consistency determination for this project and, based on the information available at this time, agrees that the project, at this stage, is consistent with the Florida Coastal Management Program. However, certain issues of concern have been identified by our reviewing agencies which will require resolution in federal consistency reviews conducted at subsequent decision points. Continued State agreement will be based, in part, on adequate reconciliation of concerns identified in the attached Department of Environmental Regulation (DER) and Department of Natural Resources (DNR) letters.

The DER, in a August 3, 1990 letter, attached to the State's response to the Draft Environmental Impact Statement, noted problems with the lack of protection for sea turtles during dredging operations. The DER is still concerned that the Final Environmental Impact Statement, paragraphs 5.01 and 5.03, does not outline the protective measures to be employed to protect sea turtles.

Please be advised that on November 19, 1990 the State notified the Environmental Protection Agency (EPA) that designation of the Canaveral Harbor Ocean Dredged Material Disposal Site (ODMDS) was inconsistent with state statutes in the Florida Coastal Management Program. A copy of this letter is attached. In the Final Environmental Impact Statement for the proposed project, the Corps of Engineers has selected the ODMDS as its first alternative for disposal of dredged material. If permanent designation of the site is resolved with the EPA, the State could concur with this disposal location.

This letter reflects your compliance with Presidential Executive Order 12372.

Sincerely,

Estus Whitfield, Deputy Director
State Clearinghouse

EW/dh

Enclosures

cc: Mark Latch, Department of Environmental Regulation
David Arnold, Department of Natural Resources
Keith McCarron, Department of Community Affairs
Louis Tesar, Department of State
Wynelle Wilson, Department of Commerce
Rob Hebert, Department of Transportation
Doug Cook, Executive Office of the Governor
Eddie Salem, Jacksonville District Corps of Engineers

Florida Department of Environmental Regulation
Twin Towers Office Bldg ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400
Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

January 16, 1991

RECEIVED
JAN 17 1991
STATE CLEARINGHOUSE

Mr. Don Henningsen, Senior Government Analyst
Intergovernmental Coordination
Office of the Governor
413 Carlton Building
Tallahassee, Florida 32399-0001

Dear Mr. Henningsen:

RE: Final Feasibility Report and Final Environmental Impact Statement, Navigation Study for Canaveral Harbor
SAI: FL9006271708C

The Department has reviewed the referenced document and supports the proposed improvements. We agree with the Corps' determination that the project is consistent with DER's authorities in the Florida Coastal Management Program. The Department's request for further documentation in the Final Environmental Impact Statement (EIS) of particular state concerns were addressed with the exception of sea turtle protection.

Despite the fact the area impacted is unlikely to affect sea turtles, the potential for problems should have been addressed. Dredging techniques designed to decrease sea turtle mortality should have been considered. Monitoring plans to verify that no sea turtle losses occurred also should have been proposed. Both the draft and final EIS do not address the sea turtle issue with respect to the dredging process itself.

The issues of deeper channel depths and increased volumes of spoils will be addressed in permit number 051791189 to be issued to the Canaveral Port Authority. Management guidelines for the ODMDS are included in appendix H of the EPA's Final EIS, Canaveral Harbor, ODMDS designation, as indicated in section 6.04 of the Corps of Engineers Final Environmental Impact Statement.

If you should have any questions please call Stephen Brooker at 904/ 488-0130.

Sincerely,

Steven K. Hall
Agency Assistance Coordinator
Division of Water Management

SKH/tsb

Tom Gardner, Executive Director

FLORIDA DEPARTMENT OF NATURAL RESOURCES

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399

Lawton Chiles
Governor
Jim Smith
Secretary of State
Bob Butterworth
Attorney General
Gerald Lewis
State Comptroller
Tom Gallagher
State Treasurer
Bob Crawford
Commissioner of Agriculture
Betty Castor
Commissioner of Education

January 18, 1991

Mr. Estus Whitfield
Office of Planning and Budgeting
Executive Office of the Governor
The Capitol
Tallahassee, Florida 32399-0001

Dear Mr. Whitfield:

SAI No. FL9006271708CR, USACE-Jacksonville District
Final Feasability Report and Environmental Impact
Statement for Canaveral Harbor, Fl. Project

The Department has reviewed the above referenced document. Althought we concur with the determination of consistency at this time, there are three issues that must be explained which have directly influenced our determination.

First, as you are aware, the Department has filed a statement with your office indicating that the designation of the Canaveral Harbor Ocean Dredged Material Disposal Area by the U. S. Environmental Protection Agency was not consistent with our statutes and authorities pursuant to the Florida Coastal Management Program. At this time, although we have indicated to the EPA the changes necessary to make the designation consistent, no formal response has been received from that agency. Since the disposal alternative selected for the Canaveral Harbor deepening project is the ODMDS, the concurrence we are making at this time is not effective if the site designation issue is not settled between the state and the EPA.

Second, we are concurring with this project because the information provided in the Feasibility Report indicates that no large quantity of beach quality material will be excavated as a part of this project. If further analysis during the detailed design phase indicates that large quantities of beach quality material are in the project area, the Department would want to work with the USACE to determine if beach placement was feasible.

Finally, our concurrence with the project does not represent the Department's position on a pending water quality certification submitted by the Canaveral Port Authority to the Department of Environmental Regulation assigned number 051791189. The Port Authority is requesting approval for a different project than the one evaluated by the USACE. We will be providing comments on the Port Authority's permit to the DER.

With these understandings the Department concurs with the consistency statement. We would like to notify the USACE that we wish to be involved during the detailed design phase and future planning for this project. Thank you for coordinating the State's response.

Sincerely,

David W. Arnold

David W. Arnold
Senior Management Analyst

cc: Lynn Griffen, DER
Dr. Pace Wilber, DER
A. J. Salem, USACE-JAX

FLORIDA DEPARTMENT OF STATE
Jim Smith
Secretary of State
DIVISION OF HISTORICAL RESOURCES
R.A. Gray Building
500 South Bronough
Tallahassee, Florida 32399-0250
Director's Office (904) 488-1480
Telecopier Number (FAX) (904) 488-3353

RECEIVED
NOV 20 1990
STATE CLEARINGHOUSE

November 14, 1990

Ms. Karen K. MacFarland, Director
State Planning and Development
 Clearinghouse
Office of Planning and Budgeting
The Capitol
Tallahassee, Florida 32399-0001

In Reply Refer To:
Laura A. Kammerer
Historic Sites
 Specialist
(904) 487-2333
Project File No. 903340

RE: Cultural Resource Assessment Request
SAI# FL9006271708CR
Navigation Study for Canaveral Harbor
Final Feasibility Report and Environmental Impact Statement
(EIS) - 81240

Dear Ms. MacFarland:

In accordance with the procedures contained in 36 C.F.R., Part 800 ("Protection of Historic Properties"), we have reviewed the referenced Final EIS and find that it adequately address this agency's recommendations concerning cultural resources. The Final EIS statements satisfy this agency's considerations.

If you have any questions concerning our comments, please do not hesitate to contact us. Your interest in protecting Florida's archaeological and historic resources is appreciated.

Sincerely,

Louis D. Tesar
for George W. Percy, Director
Division of Historical Resources
and
State Historic Preservation Officer

GWP/lak

STATE OF FLORIDA
Office of the Governor
THE CAPITOL
TALLAHASSEE, FLORIDA 32399-0001

BOB MARTINEZ
GOVERNOR

RECEIVED
NOV 8 1990
Div. of Resource Mgmt.
Dept. of Natural Resources

Date: NOV 0 6 1990

Comment Due Date: NOV 2 0 1990

SAI#: FL9006271708CR

TO: Department of Natural Resources

FROM: State Clearinghouse

SUBJECT: Intergovernmental Coordination (formerly A-95) Federal Consistency Project Review Process

The attached Notification of Intent to Apply for Federal Assistance (Standard Form 424 Application) or other federally required document (e.g., Environmental Impact Statement, Fishery Management Plan, Consistency Determination, etc.) is forwarded to your agency for review and comment in accordance with:

☒ Intergovernmental Coordination and Review Process (IC&RP), pursuant to Presidential Executive Order 12372 and Governor's Executive Order 83-150.

☒ Coastal Zone Management Act (CZMA) of 1972 and Federal Regulations (15 CFR 930) requiring an evaluation of the document for consistency with the Florida Coastal Management Program (FCMP).

☐ Other

If the document requires a CZMA/FCMP consistency evaluation, it is categorized as one of the following:

☐ Federal Assistance to State or Local Governments (15 CFR 930, Subpart F). State agencies are required to evaluate the consistency of the activity.

☒ Direct Federal Activity (15 CFR 930, Subpart C). Federal agencies are required to furnish a consistency determination for the State's concurrence or objection.

☐ Outer Continental Shelf Exploration, Development or Production Activities (15 CFR 930, Subpart E). Operators are required to provide a consistency certification for state concurrence/objection.

☐ Federal Licensing or Permitting Activity (15 CFR 930, Subpart D). Such projects will only be evaluated for consistency when there is not an analogous state license or permit.

Your review and comments for State Clearinghouse projects should address themselves to the extent to which the project is in accord with or contributes to the fulfillment of your agency's plans or the achievement of your projects, programs and objectives.

For projects circulated for evaluation of consistency with the FCMP, the process is slightly different. An additional review is not necessary as your plans, policies and objectives are, inlarge part, mandated by appropriate Florida statutory authority. However, for consistency review purposes, it is suggested that your comments in response to the attached document be expressed as follows.

Based on an analysis of the mandatory enforceable provisions and recommended policies of the core FCMP statutes and implementing rules which your agency administers,
the proposed activity is:

- Consistent

- Not Consistent. Objections to an activity must describe how the proposed project is inconsistent with the specific provisions included in the FCMP and alternatives if any, which if adopted, would allow the activity to be consistent.

- Not consistent due to failure to provide sufficient information to assess the consistency of the activity. Objections or findings of inconsistency based on insufficient information must describe the nature of information is necessary to determine consistency.

Should you need additional information from the applicant for IC&RP purposes or to evaluate the consistency of the project with the FCMP, please contact the applicant for the required information and notify this office by the due date. The State Clearinghouse will promptly inform the applicant that a project review cannot be completed until such information is provided to reviewers. Should a conference be necessary, please contact this office as soon as possible. Timely response is essential in order to preserve the state's rights in both IC&RP and CZMA Consistency proceedings.

Please check the appropriate box below, provide any comments on your agency's stationary and return to the State Clearinghouse by the due date. In both telephone conversation and written correspondence, please refer to the State Application Identifier (SAI) number.

Enclosure

****

TO: Director
State Clearinghouse
Office of Planning and Budgeting
Executive Office of the Governor
The Capitol
Tallahassee, Florida 32399-0001
(904) 488-8114

	E.O. 12372	FEDERAL CONSISTENCY
	☒ NO COMMENT	☐ CONSISTENT (COMMENTS ATTACHED)
	☐ COMMENTS ATTACHED	☐ NOT CONSISTENT (COMMENTS ATTACHED)

FROM: GFWFC

SAI#: FL9006271708CR

DIVISION/BUREAU: OES - GFC

REVIEWER: Brian Barnett

DATE: Nov. 16, 1990

RECEIVED
NOV 20 1990
STATE CLEARINGHOUSE

For projects circulated for evaluation of consistency with the FCMP, the process is slightly different. An additional review is not necessary as your plans, policies and objectives are, inlarge part, mandated by appropriate Florida statutory authority. However, for consistency review purposes, it is suggested that your comments in response to the attached document be expressed as follows.

Based on an analysis of the mandatory enforceable provisions and recommended policies of the core FCMP statutes and implementing rules which your agency administers,
the proposed activity is:

- Consistent
- Not Consistent. Objections to an activity must describe how the proposed project is inconsistent with the specific provisions included in the FCMP and alternatives if any, which if adopted, would allow the activity to be consistent.
- Not consistent due to failure to provide sufficient information to assess the consistency of the activity. Objections or findings of inconsistency based on insufficient information must describe the nature of information is necessary to determine consistency.

Should you need additional information from the applicant for IC&RP purposes or to evaluate the consistency of the project with the FCMP, please contact the applicant for the required information and notify this office by the due date. The State Clearinghouse will promptly inform the applicant that a project review cannot be completed until such information is provided to reviewers. Should a conference be necessary, please contact this office as soon as possible. Timely response is essential in order to preserve the state's rights in both IC&RP and CZMA Consistency proceedings.

Please check the appropriate box below, provide any comments on your agency's stationary and return to the State Clearinghouse by the due date. In both telephone conversation and written correspondence, please refer to the State Application Identifier (SAI) number.

Enclosure

****

	E.O. 12372	FEDERAL CONSISTENCY
TO: Director State Clearinghouse Office of Planning and Budgeting Executive Office of the Governor The Capitol Tallahassee, Florida 32399-0001 (904) 488-8114	☒ NO COMMENT	☒ CONSISTENT ~~(COMMENTS ATTACHED)~~
	☐ COMMENTS ATTACHED	☐ NOT CONSISTENT (COMMENTS ATTACHED)

FROM: DCA

SAI#: FL9006271708CR

DIVISION/BUREAU: Resource Planning & Management

REVIEWER: Keith McCarron

DATE: 11/14/90

RECEIVED
NOV 21 1990
STATE CLEARINGHOUSE

For projects circulated for evaluation of consistency with the FCMP, the process is slightly different. An additional review is not necessary as your plans, policies and objectives are, inlarge part, mandated by appropriate Florida statutory authority. However, for consistency review purposes, it is suggested that your comments in response to the attached document be expressed as follows.

Based on an analysis of the mandatory enforceable provisions and recommended policies of the core FCMP statutes and implementing rules which your agency administers,
the proposed activity is:

- Consistent
- Not Consistent. Objections to an activity must describe how the proposed project is inconsistent with the specific provisions included in the FCMP and alternatives if any, which if adopted, would allow the activity to be consistent.
- Not consistent due to failure to provide sufficient information to assess the consistency of the activity. Objections or findings of inconsistency based on insufficient information must describe the nature of information is necessary to determine consistency.

Should you need additional information from the applicant for IC&RP purposes or to evaluate the consistency of the project with the FCMP, please contact the applicant for the required information and notify this office by the due date. The State Clearinghouse will promptly inform the applicant that a project review cannot be completed until such information is provided to reviewers. Should a conference be necessary, please contact this office as soon as possible. Timely response is essential in order to preserve the state's rights in both IC&RP and CZMA Consistency proceedings.

Please check the appropriate box below, provide any comments on your agency's stationary and return to the State Clearinghouse by the due date. In both telephone conversation and written correspondence, please refer to the State Application Identifier (SAI) number.

Enclosure

* * *

E.O. 12372

☑ NO COMMENT

☐ COMMENTS ATTACHED

FEDERAL CONSISTENCY

☐ CONSISTENT (COMMENTS ATTACHED)

☐ NOT CONSISTENT (COMMENTS ATTACHED)

TO: Director
State Clearinghouse
Office of Planning and Budgeting
Executive Office of the Governor
The Capitol
Tallahassee, Florida 32399-0001
(904) 488-8114

FROM: DOAG&CS

SAI#: FL9006271708CR

DIVISION/BUREAU: Forestry / FREP

REVIEWER: Philip Hornick

DATE: 11/13/90

RECEIVED
NOV 16 1990
STATE CLEARINGHOUSE

FLORIDA DEPARTMENT OF TRANSPORTATION
BOB MARTINEZ
GOVERNOR
605 Suwannee Street, Tallahassee, Florida 32399-0450
BEN G. WATTS
SECRETARY

November 14, 1990

RECEIVED
NOV 19 1990
STATE CLEARINGHOUSE

MEMORANDUM

TO: State Clearinghouse
Central Office ICAR Coordinator

FROM: Rob Hebert, Manager-Ports/Intermodal
Rail Office
Florida Department of Transportation

RE: ICAR Federal Consistency Project Review Process
Navigation Study for Canaveral Harbor
SAI# FL9006271708CR

In accordance with departmental procedure 525-010-205-a, and State Clearinghouse requirements for review and comment on potential federal projects that may affect state programs and objectives, please be advised that the above-referenced proposed study or project:

_____ Does influence and impose a potential impact on existing state programs or objectives under Rail Office jurisdiction to the extent noted in the following comments:

__✓__ Does not influence or impose a potential impact on existing state programs or objectives under Rail Office jurisdiction at this time, and no comments or recommendations are required.

Should further information or explanation be required, please feel free to contact the Rail Office at (904) 488-5704.

RGH/
Attachment
c: District Office (if appropriate)
FDOT ICAR Coordinator w/att.
File

Florida Department of Environmental Regulation

Twin Towers Office Bldg ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

November 19, 1990

NOV 20 1990

STATE CLEARINGHOUSE

Mr. Robert B. Howard
Chief, Coastal Programs Unit
United States Environmental Protection Agency
345 Courtland Street
Atlanta, Georgia 30365

RE: Final Environmental Impact Statement, Ocean Dredged Material Disposal Site Designation, Canaveral Harbor, Florida

SAI: FL9004241341C

The State of Florida has completed its review of the above referenced document and has evaluated the federal consistency determination for the Canaveral Harbor Ocean Dredged Material Disposal Site (ODMDS) designation.

The Department of Environmental Regulation, as the lead coastal agency pursuant to section 306(c) of the federal Coastal Zone Management Act, 16 U.S.C. section 1456(c) and section 380.22, Florida Statutes (F.S.), hereby notifies the Region IV, Environmental Protection Agency (EPA), that the State of Florida does not support the proposal described in the Final Environmental Impact Statement (FEIS). The Department of Natural Resources (DNR) finds the proposed designation inconsistent with the Florida Coastal Management Program, specifically sections 161.142, 253.03(1) and 253.77(1), F.S. There are three areas of inconsistency: inadequacy of data documenting the dispersiveness of various materials to be deposited on the site; the placement beach quality sand in the site; and lack of specific management and monitoring plans for the site to assure the protection of State resources. A more detailed description of the State's concerns and measures to resolve them are explained in the enclosed comments from DNR.

In order for the State to reconsider its findings, the EPA will need to modify the proposal to include on-site testing to verify the dispersiveness of various types of dredged material; a commitment to exclude use of the site for beach quality sand; and a more specific monitoring and management operation for the site.

We encourage you to discuss these issues with the DNR in an effort to resolve the identified inconsistencies. Please contact Don Henningsen at (904) 488-8114 if you have any questions or wish to arrange a meeting.

In accordance with CFR 930.42(c), a copy of this letter has been sent to the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Coastal Resource Management. Mediation by the Secretary, U.S. Department of Commerce, may be sought pursuant to 15 CFR 930, subpart G, for serious disagreements between the State and a federal agency taking direct action governed by 15 CFR 930, subpart C. We request written notification as to whether EPA intends to proceed with informal conflict resolution or formal conflict mediation prior to proposed rulemaking.

Sincerely,

Dale Twachtmann

Dale Twachtmann
Secretary

DT/jb

Enclosures

c: Tom Gardner, Department of Natural Resources
Tom Pelham, Department of Community Affairs
Russell Nelson, Marine Fisheries Commission
Karen MacFarland, Executive Office of the Governor
Estus Whitfield, Executive Office of the Governor
A. J Salem, U.S. Army Corps of Engineers, Jacksonville
Timothy R. E. Keeney, Director, NOAA, Ocean and Coastal Resource Management

COMMENTS OF THE DEPARTMENT OF THE INTERIOR

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

TAKE PRIDE IN AMERICA

DEC 13 1990

ER 90/964

Mr. Donald A. Banashek
Director, Washington Review Level Center
ATTN: CEWRC-WLR-I
Kingman Building
Fort Belvoir, Virginia 22060-5576

Dear Mr. Banashek:

Thank you for the letter of October 25, 1990, requesting our views and comments on the proposed report of the Chief of Engineers and the Final Environmental Statement for Canaveral Harbor Navigation Study, Brevard County, Florida.

Our review did not surface any new or unresolved conflicts with programs or missions of this Department. We therefore, have no objection to the recommendations and findings discussed in your report.

Sincerely,

John H. Farrell
for Jonathan P. Deason
Director
Office of Environmental Affairs

COMMENTS OF THE DEPARTMENT OF TRANSPORTATION

U.S. Department
of Transportation
**United States
Coast Guard**

Commandant (G-MEP-1)
United States Coast Guard

MAILING ADDRESS:
2100 2nd St., SW
Wash., DC 20593
(202) 267-0504

16452

February 12,1991

Mr. Donald A. Banashek
Director
Washington Level Review Center
ATTN: CEWRC-WLR-I
Fort Belvoir, Virginia 22060-5576

Dear Mr. Banashek:

This is in response to your letter of October 25, 1990, in which you transmitted the proposed report of the Chief of Engineers, the report of the district engineer, and final environmental impact statement (FEIS) on Canaveral Harbor, Florida. We have reviewed the reports and FEIS and have no comments to offer.

Thank you for providing the opportunity for review of these reports.

Sincerely,

G. D. JENKINS
Lieutenant Commander, U.S. Coast Guard
Chief, Prevention, Enforcement,
and Standards Branch
Marine Environmental Protection
Division
By direction of the Commandant

COMMENTS OF THE ENVIRONMENTAL PROTECTION AGENCY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

February 25, 1991

Washington Level Review Center
ATTN: CEWRC-WLR-I
Kingman Building
Fort Belvoir, VA 22060-5576

Subject: Feasibility Report and Final Environmental Impact Statement (FEIS) for Canaveral Harbor (Brevard County) Florida

Dear Mr. Banashek:

Pursuant to Section 309 of the Clean Air Act and Section 102 (2)(C) of the National Environmental Policy Act, EPA, Region IV reviewed the subject document and provided comments to the Jacksonville District and South Atlantic Division elements of the Corps of Engineers. The thrust of our comments was as follows:

The recommended plan calls for extending the civil works portion of the entrance channel together with deepening the inner channel, middle turning basin, and the west access channel. Disposal of approximately 1.0 million yards of predominantly silt and clay would be done in the Canaveral Harbor offshore dredged material disposal site (ODMDS) located about 9 miles southeast of the harbor entrance.

The Preliminary Section 103 Ocean Disposal Evaluation Report indicated that the dredged material is predominantly fine grained; hence, it is subject to evaluation regarding suitability for ocean disposal. The changes to the text of the FEIS in regard to the testing evaluation satisfies our concerns stated in the draft document. However, this concurrence regarding the 103 Report is predicated on a re-evaluation of material suitability using the "Green Book" protocol. This work would be conducted at the appropriate time prior to construction/disposal such that EPA would have the opportunity to review the testing proceedings/results in a timely fashion to allow effective input.

If we can be of further assistance in this matter, Dr. Gerald Miller (FTS 257-3776) will serve as initial point of contact.

Sincerely yours,

Heinz Mueller

Heinz J. Mueller, Chief
Environmental Policy Section

CANAVERAL HARBOR, FLORIDA

REPORT OF THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

CECW-PM (10-1-7a) July 24,1991

SUBJECT: Canaveral Harbor, Florida

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress my report on improvements to the existing navigation project at Canaveral Harbor, Florida. It is accompanied by the reports of the district and division engineers and the Board of Engineers for Rivers and Harbors. These reports were prepared in final response to resolutions adopted by the Committee on Public Works of the United States Senate on 1 April 1969 and the Committee on Public Works of the United States House of Representatives on 11 December 1969. The study resolutions requested that the Board of Engineers for Rivers and Harbors review the report of the Chief of Engineers on Canaveral Harbor, Florida, published as Senate Document 140, Eighty-seventh Congress, with a view to determining whether the existing project should be modified in any way at the present time to accommodate present and prospective future commerce, both military and civilian. Preconstruction engineering and design activities for the Canaveral Harbor project are being continued under authority provided by the 1 April 1969 and 11 December 1969 resolutions.

2. The district and division engineers considered various plans to solve the navigation problems at Canaveral Harbor. The reporting officers recommend deepening the middle turning basin and channel from 35 feet to 39 feet; increasing the authorized depth in 1800 feet of the west access channel from 31 to 39 feet; deepening the inner channel from 36 to 40 feet and increasing its width from 300 feet to 400 feet; deepening an access channel (referred to as north branch channel) to 39 feet with a width of 350 feet from the main channel and middle turning basin northward to the north end of dock number 4; and increasing the authorized depth of the entrance channel from 37 feet to 41 feet. The U.S. Navy maintains a depth of 44 feet in the Canaveral Harbor entrance channel from the ocean to the Trident submarine basin and a depth of 41 feet within the Navy basin. The recommended plan also provides for construction of recreation facilities on existing federally owned project lands at Lock Park and the Jetty Park.

3. The report has been reviewed by the Washington Level Review Center (WLRC). That review indicates that the proposed project complies with applicable U.S. Army Corps of Engineers planning procedures and regulations. WLRC noted that the reporting officers proposed to deepen the north branch channel at 100 percent non-Federal cost. However, additional information obtained during Washington level review indicated that multiple users would benefit from the recommended deepening of that channel. Therefore, WLRC concluded that the north branch channel should be considered for Federal cost sharing.

4. The Board of Engineers for Rivers and Harbors (BERH) concurs in the plan recommended by the reporting officers and in the review findings of the WLRC. BERH also concludes that the north branch channel is a general navigation facility and that deepening should be cost shared accordingly. This adjustment would increase Federal costs by $428,000. Therefore, based on October 1990 price levels, the total first cost of the recommended plan is $11,889,000, of which $6,448,000 would be Federal, including the adjustment for the north branch channel. Average annual charges reflecting a 50-year period of economic analysis and an 8 3/4-percent interest rate are $1,165,000. Average annual benefits are $1,922,000, and the benefit-cost ratio is 1.7.

5. I concur in the findings, conclusions, and recommendation of the Board.

6. The recommendation contained herein reflects the information available at this time and current departmental policies governing formulation of individual projects. This does not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program nor the perspective of higher levels within the executive branch. Consequently, the recommendation may be modified before it is transmitted to the Congress as a proposal for authorization and implementation funding. However, prior to transmittal to the Congress, the sponsor, the State, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

H. J. HATCH
Lieutenant General, USA
Chief of Engineers

DEPARTMENT OF THE ARMY
BOARD OF ENGINEERS FOR RIVERS AND HARBORS
KINGMAN BUILDING
FORT BELVOIR, VIRGINIA 22060-5576

REPLY TO
ATTENTION OF

CEBRH (10-1-7a) 31 May 1991

SUBJECT: Canaveral Harbor, Florida

Chief of Engineers
Department of the Army
Washington, DC 20314-1000

SUMMARY OF BOARD ACTION

The board concurred in the reporting officers' plans for deep-draft navigation and recreation improvements at Canaveral Harbor, Florida. The board finds that improvements to provide increased channel depths and widths and additional recreation facilities are technically sound, economically justified, and socially and environmentally acceptable. The channel improvements will allow deeper draft vessels to serve the harbor more economically, and the channel widening will improve vessel safety. Recreational facility improvements will provide additional safer access to the entrance channel jetty and provide additional recreational use of back-bay areas in the vicinity of the Federal navigation lock between the harbor and the Banana River. Features of the improvement plan consist of:

a. Increasing the authorized depth of the civil works entrance channel to 41 feet and extending it to the natural 41-foot-depth contour along the existing 44-foot-deep U.S. Navy project channel alignment (affects cost allocation between Navy and civil projects);

b. Deepening and widening the inner channel to 40 feet deep by 400 feet wide;

c. Deepening to 39 feet a trapezoidal area to provide a 1,200-foot-diameter turning and berthing access area within existing middle turning basin;

d. Deepening the north branch channel to 39 feet with a width of 350 feet extending from the main channel and middle turning basin northward to the north end of dock 4;

e. Deepening to 39 feet the first 1,800 feet of the west access channel; and

f. Constructing recreational facilities at the Canaveral Harbor Lock Park and the Jetty Park.

Based on October 1990 price levels, the first cost of the recommended improvements is estimated at $11,889,000 ($10,923,000 for navigation and $966,000 for recreation). Of the first cost, $6,448,000 is Federal ($5,965,000 for navigation and $483,000 for recreation). Average annual benefits are estimated $1,482,000 for navigation transportation savings and $440,000 for recreation. The benefit-cost ratio for the recommended plan is 1.7. For navigation only, the benefit-cost ratio is 1.5.

1. AUTHORITY. This report is in response to resolutions by the Committee on Public Works of the United States Senate adopted 1 April 1969 and the Committee on Public Works of the United States House of Representatives adopted 11 December 1969. The resolutions requested the Board of Engineers for Rivers and Harbors to determine whether the existing project should be modified in any way at this time. The resolutions are quoted in the district engineer's report.

2. DESCRIPTION OF THE STUDY AREA. Canaveral Harbor is on the east coast of the State of Florida in Brevard County close to the John F. Kennedy Space Center. It is 167 nautical miles south of Jacksonville, Florida, and 175 nautical miles north of Miami, Florida. Located about midway in the Florida peninsula, the port is a major deep-draft import/export port serving primarily the surrounding counties of Brevard, Orange, Osceola, and Seminole. It is a manmade, deepwater port and harbor constructed on dredged and filled lands. Both the U.S. Air Force and U.S. Navy maintain an active presence on land and harbor areas in the northeast section of the port. Canaveral is an active and dynamic, growing port with a broad mix of facilities. The Canaveral Port Authority has recently constructed a large basin in the northwest area of the port which is planned for development as a cruise ship area. At present about two-thirds of the deep-draft commercial terminal and berthing areas are along the south side of the port. The present port facilities include dry and cold warehousing and general cargo handling, petroleum products storage, cement storage, scrap metal processing, cruise ship passenger terminals, seafood processing, marine repair, and recreational craft accommodations. Although adjacent to a wildlife preserve, vegetation and wildlife are sparse on the developed and semi-developed lands surrounding the port. Several species of turtles occur in the harbor and surrounding area, and manatees have been identified in the area.

3. EXISTING FEDERAL PROJECT. Initial construction of the manmade harbor was authorized in 1945. The existing Federal deep-draft navigation project provides for an entrance channel 37 feet deep and 400 feet wide and an inner channel 36 feet deep

and 300 feet wide to the middle turning basin which has an authorized depth of 35 feet. The west turning basin and west access channel have an authorized depth of 31 feet. However, local interests have recently deepened the west basin and access channel to 35 feet. The turning basin provides a turning diameter of 1,400 feet. The U.S. Navy maintains a depth of 44 feet in the entrance channel to the Trident submarine basin and a depth of 41 feet within the basin. There are entrance jetties on either side of the entrance channel, and a sand transfer plant is also part of the authorized project. Construction of the sand transfer plant, scheduled for 1992, also includes a 500-foot extension to the south jetty. A barge canal 12 feet deep by 125 feet wide extends from a shallow-draft lock at the west end of the deep-draft harbor to the Atlantic Intracoastal Waterway in the Indian River. In addition, a military barge canal 8 feet deep by 100 feet wide located in the Banana River provides water access to the John F. Kennedy Space Center.

4. PORT COMMERCE. Total port tonnage for 1987 was about 2.2 million tons, of which four major bulk commodities (gasoline, fuel oil, building cement, and scrap metal) accounted for 84 percent, or 1,855,000 tons annually. The annual tonnage handled for each of these bulk commodities has been increasing in recent years, and the size of the vessels transporting them has also increased. Total annual tonnage for the four major bulk commodities is expected to increase from 1,855,000 tons in 1987 to 3,010,000 tons by 2003. Fuel oil imports declined from 1975 to 1985 due to utility company shifts to coal as a primary source of energy. However, since 1985, fuel oil imports have risen steadily. Total fuel oil receipts from both domestic and foreign sources together are projected to reach 1,043,000 tons by year 2003. Building cement receipts have been somewhat erratic in recent years but have generally followed construction activity trends. Cement receipts are projected to reach 1,100,000 tons by 2003. Scrap metal exports from Port Canaveral have been paralleling increases in total shipments of scrap metal from all U.S. ports. Scrap metal exports are projected to reach 317,000 tons by year 2003.

5. PROBLEMS, NEEDS, AND IMPROVEMENTS DESIRED

a. NAVIGATION. There is a need for deeper channel depths at Canaveral Harbor to allow the larger bulk carriers calling at the port to load and operate more fully and efficiently. Both the larger dry and liquid bulk carriers have design operating drafts of between 38 and 40 feet. At present under normal operating conditions, using 2 feet of available tide, these bulk carriers are restricted to maximum operating drafts of 33.5 feet. At present these bulk carriers must off-load some cargo at another harbor before Canaveral Harbor. Improved depths would allow these vessels to proceed directly to Canaveral Harbor and realize a transportation cost savings. The Canaveral Port Authority has indicated a desire for deeper and wider channels to better serve the bulk vessels which call at the port terminals handling gasoline, fuel oil, cement, and scrap iron. The Canaveral Pilots Association has cooperated in demonstrating the need for channel widening and turning basin deepening. The pilots have experienced ship handling problems in the section of the inner channel where the channel narrows from 400 feet to 300 feet, and this will be a more frequent problem with increased use of larger ships.

b. RECREATION. Visitors to Port Canaveral make use of the several existing recreational opportunities. They include overnight camping and beach recreation at the Jetty Park, a boat launching ramp and picnic area in the middle harbor area, a visitor viewing area at the canal lock, a recreational craft marina, and several restaurants and tourist areas operated in conjunction with the cruise ship facilities. There is a demand for additional recreational facilities. A jetty fishing walkway facility is needed to provide for safer and increased use of fishing opportunities. There are no recreational facilities at the lock site. Picnicking, restrooms, and fishing access to the Banana River are desired by local interests.

6. ALTERNATIVES CONSIDERED. Alternative channel depths of 37, 39, and 41 feet were considered for the inner channel, middle turning basin, and west access channel along with alternative channel widths of 300 to 400 feet. The Federal maintenance of a 35-foot-deep channel for the west turning basin was considered in lieu of maintaining the channel at the present 31-foot depth; however, it was found to lack economic justification. Widening of the bend into the west turning basin was also considered but was found to lack economic justification. The alternative of beach placement of dredged materials was also considered, but none of the material was found to be suitable for beach fill.

7. PROPOSED PLAN OF IMPROVEMENT. The plan recommended by the reporting officers consists of:

a. Increasing the authorized depth of the civil works entrance channel to 41 feet and extending it to the natural 41-foot-depth contour along the existing 44-foot-deep U.S. Navy project channel alignment;

b. Deepening and widening the inner channel to 40 feet deep by 400 feet wide;

c. Deepening a trapezoidal area of the middle turning basin to 39 feet to provide a 1,200-foot-diameter turning basin and berthing area access;

d. Deepening the north branch channel to 39 feet with a width of 350 feet extending from the main channel and middle turning basin northward to the north end of dock 4;

e. Deepening to 39 feet the eastern end of the west access chaneel; and

f. Constructing recreational facilities at Canaveral Harbor Lock Park and Jetty Park. Picnic, restroom, fishing access, and play yard facilities would be constructed at the lock site, and a paved jetty walkway with guardrail and lighting and a fish cleaning station would be included at the Jetty Park.

Dredged material amounting to an estimated 1,069,000 cubic yards from the channel deepening and widening will be disposed of in an approved ocean disposal area. Deepening of berthing areas by local interests will require disposal of an additional 83,000 cubic yards of dredged material.

8. ECONOMIC EVALUATION. Based on October 1989 price levels, the district engineer estimates the first cost of the proposed project plan to be $11,419,000 of which $5,827,500 would be Federal. Federal first costs are split between navigation at $5,367,000 and recreation at $460,500. Total average annual charges, based on an interest rate of 8 7/8 percent and a 50-year period for economic analysis, would be $1,133,000. Average annual benefits associated with navigation transportation savings and increased recreational opportunities are estimated at $1,479,000 and $440,000, respectively. The overall project benefit-cost ratio is 1.7. The benefit-cost ratio for navigation features alone is 1.5.

9. ENVIRONMENTAL IMPACTS. Implementation of the recommended plan is expected to have insignificant adverse environmental impact in the harbor area and at the approved offshore disposal site. There will be minor short-term losses of biological resources associated with the areas to be dredged; however, these areas will quickly recolonize. There are several endangered species in the area; notably, manatee and several species of sea turtles. Through coordination and consultation with the U.S. Fish and Wildlife Service and National Marine Fisheries Service,

measures have been incorporated into the proposed construction procedures to avoid impacts. There are no known cultural resources impacted by the project.

10. RECOMMENDATION OF THE REPORTING OFFICERS. The district engineer recommends that the existing project for deep-draft navigation at Canaveral Harbor, authorized by the River and Harbor Acts of March 1945 and October 1962, be modified to provide for implementation of a Federal project for deeper commercial navigation and additional recreational facilities, in accordance with the plan selected in his report, with such further modification thereto as in the discretion of the Chief of Engineers may be advisable. His recommendation is made subject to certain requirements of local cooperation and subject to cost-sharing, financing, and other requirements of the Water Resources Development Act of 1986, as amended. The division engineer concurs.

REVIEW BY THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

11. GENERAL. The board's review encompassed the overall technical, economic, institutional, environmental, and policy aspects involved in the formulation of alternative plans of improvement and in the findings, conclusions, and recommendation of the reporting officers. The board considered the results of the Washington level review and the conformance of the recommended plan with essential elements of the Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies and compliance with other applicable administrative and legislative policies and guidelines. The board also considered the views of interested parties including Federal, State, and local agencies.

12. RESPONSES TO THE DIVISION ENGINEER'S PUBLIC NOTICE. The division engineer issued a public notice on 28 September 1990 stating the findings and recommendation of the reporting officers and inviting interested parties to provide comments to the Washington Level Review Center (WLRC). No communications were received in response to the division engineer's notice.

13. STATE AND FEDERAL AGENCY 90-DAY REVIEW. State and Federal agency review was initiated by WLRC on 25 October 1990 and completed on 23 January 1991. The U.S. Department of the Interior responded indicating no objections to the findings and recommendations in the report. The State of Florida responded that the proposed project is in accord with State plans, programs, procedures, and objectives and that it is consistent with the Florida Coastal Zone Management Program at this time.

The Atlanta regional office of the U.S. Environmental Protection Agency responded that the final environmental impact statement adequately addressed the testing of materials to be dredged. The Commandant, U.S. Coast Guard, responded for the U.S. Department of Transportation indicating no comment on the recommended plan. No response was received from the U.S. Department of Commerce. The regional environmental office of the U.S. Air Force responded to the 90-day State and agency review request, stating that the recommended plan would not adversely affect area Air Force operations.

14. FINDINGS AND CONCLUSIONS. The Board of Engineers for Rivers and Harbors concurs in the plan of improvements recommended by the reporting officers and in the review findings of the WLRC. The board finds that the recommended improvements, identified as the national economic development (NED) plan, are economically justified, technically sound, and environmentally and socially acceptable. The board believes that the proposed navigation improvements are needed to more economically and safely transport bulk commodities using larger vessels with operating drafts ranging from 32 to 42 feet. The board finds that the recreational features included in the recommended plan are appropriate for Federal participation, are needed to meet existing demands, and provide for safe visitor use.

15. The board notes that the district engineer has included deepening of the north branch channel at 100 percent non-Federal cost in his report. This channel connects the middle turning basin area to the berthing areas serving the harbor's scrap metal processing and shipping operation. Project benefits accrue to scrap metal shipping. Upon further examination of the berthing areas previously considered as being used only by a scrap metal shipper, the board concludes that the north branch channel is a general navigation facility and that deepening should be cost shared accordingly. The berthing area served by the north branch channel is owned and directly operated by the Canaveral Port Authority. The berths in question (Canaveral Port Authority docks 3 and 4) are open to all shippers on equal terms. Other general cargo such as lumber is expected to make use of the deeper channel in the future. In addition, some of the larger tankers presently tie off at the berth while waiting to unload cargo. This change amounts to a $428,000 increase in Federal costs. The North Branch Channel would be 350 feet wide and 39 feet deep and extend from the main channel and middle turning basin northward, parallel to berthing areas 3 and 4, to the end of dock 4. The appropriate width of the non-Federal berthing areas, or distance of the Federal channel from dock structures,

would be determined by the district engineer during future planning, engineering, and design studies.

16. At October 1990 price levels, the total first cost of the improvements is estimated at $11,889,000 of which $6,448,000 would be Federal, including the board's adjustment in cost sharing for the north branch channel. Based on a 50-year period of analysis and an interest rate of 8 3/4 percent, the estimated annual benefits and costs are $1,922,000 and $1,165,000, respectively. The benefit-cost ratio is 1.7. For navigation only, the estimated annual benefits and costs are $1,482,000 and $1,018,000, respectively, yielding a benefit-cost ratio of 1.5.

17. RECOMMENDATION. The board recommends that deep-draft navigation and recreational improvements for Canaveral Harbor, Florida, be authorized for implementation generally in accordance with the reporting officers' recommended plan, with such modifications as in the discretion of the Chief of Engineers may be advisable. This recommendation is subject to cost sharing, financing, and other requirements of Public Law 99-662 for this type of project and as otherwise provided by laws and policies.

18. In accordance with Public Law 99-662, the non-Federal share of the costs for commercial harbor navigation improvements for depths between 20 and 45 feet, as recommended for Canaveral Harbor, Florida, will be 35 percent of the general navigation features, 25 percent of which must be paid during the period of construction of the project. The additional 10 percent of the non-Federal costs of the general navigation features may be paid with interest over a period not to exceed 30 years. The value of lands, easements, rights-of-way, relocations, and dredged material disposal areas provided by non-Federal interests may be credited toward the additional 10-percent non-Federal cost. Including these costs, consistency with Public Law 99-662 and other laws and policies requires non-Federal interests to be responsible for items of local cooperation specific to this project as follows:

a. Pay during construction 25 percent of the cost of construction of the general navigation portion of the project having a depth in excess of 20 feet but not in excess of 45 feet;

b. Pay an additional 10 percent of the cost of the general navigation features of the project in cash over a period not to exceed 30 years at an interest rate determined pursuant to section 106 of Public Law 99-662. The value of lands, easements, rights-of-way, relocations, and dredged material disposal areas required for the general navigation features of the proposed project improvement will be credited toward this payment;

c. Pay 50 percent of the cost of construction of the recreational features of the project during construction;

d. Operate, maintain, replace, and rehabilitate the recreational facilities at no cost to the Federal Government;

e. Hold and save the United States free from damages due to the construction and operation and maintenance of the project, except for damages due to the fault or negligence of the United States or its contractors;

f. Acquire necessary lands, easements, rights-of-way, dredged material disposal areas, and temporary excavated material storage areas and provide all necessary retaining dikes, bulkheads, and embankments, or pay the costs of such retaining works;

g. Perform or assure the performance of all relocations and alterations necessary for construction, operation, and maintenance of the project, including utilities, pipelines, cables, and sewer outlets necessary to carry out the project;

h. Provide and maintain adequate public docks, terminals, bulkheads, and transfer facilities open to the use of all on equal terms and provide and maintain depths in berthing areas and local access channels serving the terminals commensurate with project depths;

i. Prohibit erection of any structure that would encroach on the Federal channel as authorized at such distance to be determined by the district engineer; and

j. Assume complete financial responsibility for the cleanup of hazardous materials located on project lands and regulated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and be responsible for operating, maintaining, repairing, replacing, and rehabilitating the project in a manner so that liability will not arise under CERCLA.

19. The board's recommendation reflects the information available at this time and current departmental policies governing formulation of individual projects. The recommendation does not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program nor the perspective of higher review levels within the executive branch. Consequently, the recommendation may be modified before being transmitted to the Congress as a proposal for authorization and implementation finding. However, prior to transmittal to the Congress, the sponsor, the State, interested Federal agencies and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

FOR THE BOARD:

C E Edgar III

C. E. EDGAR III
Major General, USA
Chairman

SYLLABUS

The Canaveral Port Authority and other local interests request improvement of Canaveral Harbor to provide increased depths and widths in the existing Federal channel. They also request consideration of Federal assumption of maintenance of increased depths, provided by them, and of opportunities for recreational development at Canaveral Harbor. The requested navigation improvements would allow deep draft vessels to call at the harbor with deeper drafts and more cargo tonnage, resulting in transportation cost savings. This study addresses economic justification and environmental impacts of navigation and recreation improvements. The requirements of Section 404(r) of Public Law 92-500, as amended, have been met.

The recommended plan of improvement for commercial navigation and recreational features is economically feasible. Annual benefits for that plan are estimated at $1,919,000, which include $1,479,000 in navigation benefits and $440,000 in recreational benefits. Annual charges are estimated at $1,133,000 using the current water resources projects evaluation interest rate of 8 7/8 percent. The recommended plan has a benefits-to-costs ratio of 1.7 to 1.

It is recommended that the authorized project for Canaveral Harbor be modified to extend the outer reach of the Civil Works Entrance Channel to the 41-foot contour along the existing Navy project channel alignment; deepen the inner channel reach to 40 feet and widen it to 400 feet; deepen a trapezoidal shaped area off the channel for a combined 1,200-foot diameter area in the Middle Turning Basin to 39 feet; and deepen the first 1,800 feet of the west access channel to 39 feet. Also included in the recommended plan are the construction of recreation facilities at the Canaveral Harbor Lock Park and the Jetty Park. The first cost of the recommended improvements is now estimated at $11,419,000 ($10,498,000 for navigation improvements and $921,000 for recreation improvements). Additional annual costs are also included to maintain a lengthened entrance channel and to operate and maintain the recreation facilities. Those additional annual amounts were estimated to be $26,000 and $56,000, respectively.

STUDY AUTHORITY

This study was authorized by resolutions adopted by the Committees on Public Works of the United States Senate and House of Representatives on April 1, 1969 and December 11, 1969, respectively, as follows:

"RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby requested to review the report of the Chief of Engineers on Canaveral Harbor, Florida, published as Senate Document Numbered 140, Eighty-seventh Congress, with a view to determining whether the existing project should be modified in any way at the present time to accommodate present and prospective future commerce, both military and civilian."

"Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on Canaveral Harbor, Florida, published as Senate Document numbered 140, Eighty-seventh Congress, with a view to determining whether the existing project should be modified in any way at the present time to accommodate present and prospective future commerce, both military and civilian."

STUDY PURPOSE AND SCOPE

The study focused on evaluation of navigation and related problems in the Canaveral Harbor area, specifically in relation to the need for increased channel depths, channel and turning basin wideners, and Federal assumption of operation and maintenance of a channel and turning basin constructed by local interests. Overall environmental, social, and economic needs and desires of interests in the study area were identified to the extent possible under technological and study funding limits. Alternative solutions were formulated to satisfy navigation needs within economic and environmental constraints set forth in local, State, and Federal regulations. Base data for the evaluation of alternatives came from numerous reference sources as well as field work to obtain core borings, hydrographic surveys, and economic factors including existing and prospective commerce and vessel traffic. The study considered the costs, benefits, and environmental impacts of the alternatives and enabled the selection of a plan to improve navigation within the harbor. The period of analysis for this study is the 50-year period from 1993, the earliest year that harbor improvements could reasonably be expected, to 2043.

PRIOR STUDIES AND REPORTS

There are ten prior studies and reports on Canaveral Harbor. The studies are listed in table 1. The table also identifies the Congressional documents which published the studies' results and whether the recommendations were favorable or unfavorable.

TABLE 1

CANAVERAL HARBOR PRIOR STUDIES AND REPORTS

Type Study 1/	Report Date	Recommendation	Congressional Documents Type 2/	No.	Congress	Session
PE	9/1892	Favorable	H.Ex.	54	52	2
S	2/1895	Favorable	H.Ex.	321	53	3
PE	12/1917	Unfavorable	H	875	65	2
PE	7/1927	Unfavorable	(3)	(3)	(3)	(3)
PE	11/1935	Unfavorable	(3)	(3)	(3)	(3)
PE	7/1939	Unfavorable	(3)	(3)	(3)	(3)
S	3/1941	Favorable	H	367	77	1
S	7/1962	Favorable	S	140	87	2
GDDM	12/1972	Favorable	(3)	(3)	(3)	(3)
GDM	3/1984	Favorable	(3)	(3)	(3)	(3)

NOTES: 1/ Abbreviations are:
PE = preliminary evaluations
S = surveys
GDDM = general and detailed design memorandum
GDM = general design memorandum

2/ Symbols are:
H = U.S. House of Representatives document
S = U.S. Senate document
Ex = Extract

3/ Report not published

EXISTING WATER PROJECTS

The existing Federal deep draft navigation project at Canaveral Harbor provides for an entrance channel 37 feet deep and 400 feet wide and an inner channel 36 feet deep and 300 feet wide to the middle turning basin. The authorized depth of the middle turning basin is 35 feet. The project also provides for a channel 31 feet and 400 feet wide from the middle turning basin to the west turning basin. The authorized dimensions of the west turning basin are 31 feet deep and 1,400 feet in diameter. The authorized project is shown in figure 1.

The barge canal which extends west from the deep draft navigation project at Canaveral Harbor provides a channel 12 feet deep by 125 feet wide to the Atlantic Intracoastal Waterway (AICW) in the Indian River. The barge canal includes a lock with a depth of 14 feet over the sill and chamber dimensions of 90 feet by 600 feet.

The segment of the AICW from Jacksonville to Miami traverses the Indian River and has authorized dimensions of 12 feet deep by 125 feet wide. The AICW is shown in figure 2.

The U.S. Navy maintains a depth of 44 feet in the Canaveral Harbor entrance channel from the ocean to the Trident submarine basin and 41 feet within the basin. In addition, a military barge channel in the Banana River provides water access to Cape Canaveral and has dimensions of 8 feet deep by 100 feet wide. This channel is also shown in figure 2.

EXISTING CONDITIONS

Deep draft navigation facilities served by Canaveral Harbor include liquid bulk, dry bulk, general cargo and passenger terminals. Storage facilities include refrigerated warehouses, general cargo warehouses, bulk cement silos and tank farms.

Canaveral Harbor is an important part of the transportation infrastructure for central Florida. No other port is nearer to the rapidly growing Orlando Metropolitan Statistical Area (MSA). Total tonnage moved through Canaveral Harbor in 1987 was 2,061,000 tons (excluding domestic internal shipments by shallow draft barges). Of this total, 1,844,000 tons were imported and 218,000 tons were exported. Fuel oil and gasoline accounted for 53 percent of total imports in 1987. Building cement accounted for 32 percent of total imports in that same year. The port also serves cruise ships which had 586,000 passengers in 1986.

LOCATION

Canaveral Harbor is in Brevard County on the east coast of Florida, about 9 miles north of Cocoa Beach as shown in figure 3. Canaveral Harbor is about 167 nautical miles south of Jacksonville, Florida, 152 nautical miles north of Port Everglades, Florida and 175 nautical miles north of Miami, Florida. Canaveral Harbor is approximately 50 statute miles east of Orlando, Florida. Located about midway in the Florida peninsula, the port is a major deep-draft harbor for water imports and exports in support of businesses in the surrounding counties of Brevard, Orange, Osceola and Seminole.

STUDY AREA

Primary, secondary and tertiary study areas were identified for Canaveral Harbor. The primary study area is defined as Brevard County, Florida, which includes Canaveral Harbor and all of its associated port facilities. The secondary study area includes the Orlando, Florida MSA counties of Orange, Osceola and Seminole. The tertiary study area encompasses the entire state of Florida.

The cities of Cocoa Beach, Melbourne and Titusville are within a 25 mile radius of the harbor and are included in the primary study area. The city of Orlando is within a 50 mile radius and is included in the secondary study area.

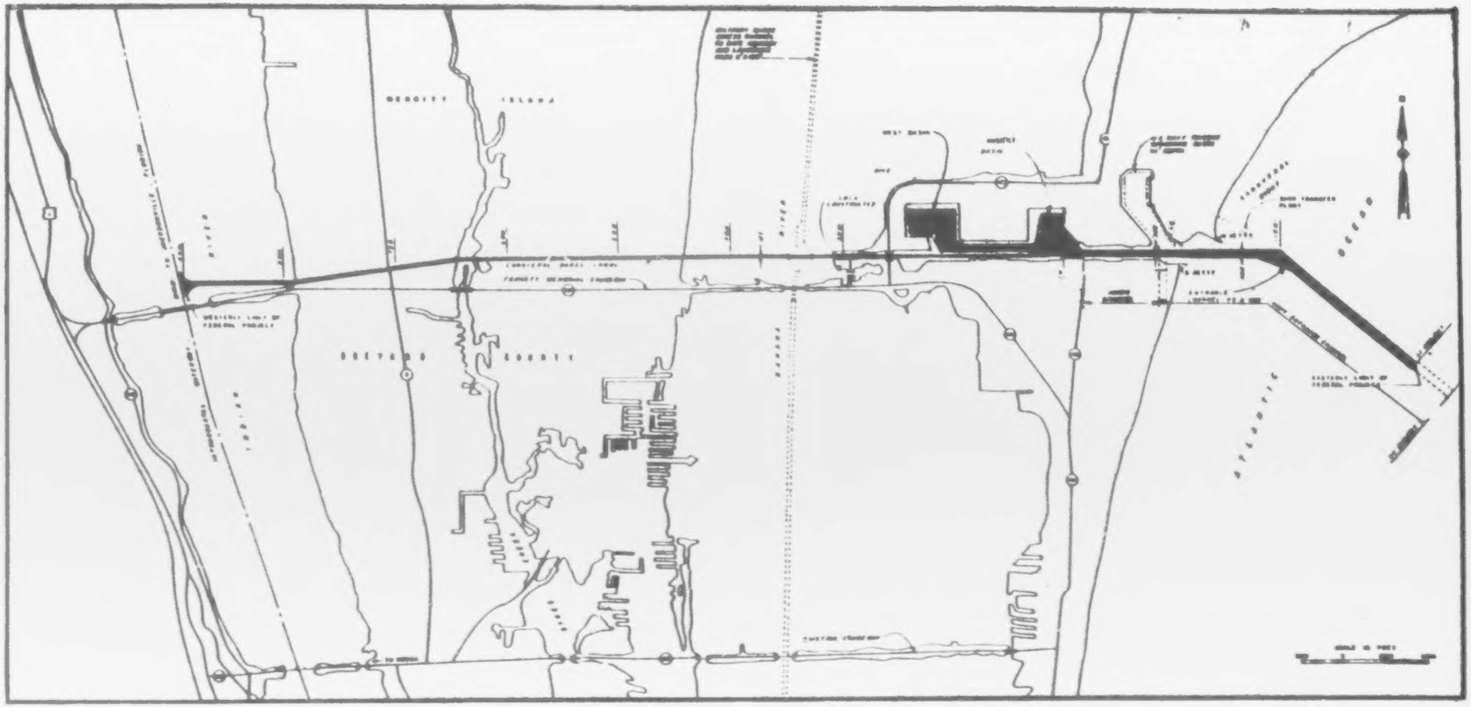

MERRITT ISLAND
BREVARD COUNTY
WEST BASIN
ATLANTIC
OCEAN

FIGURE 1   Canaveral Harbor, Florida

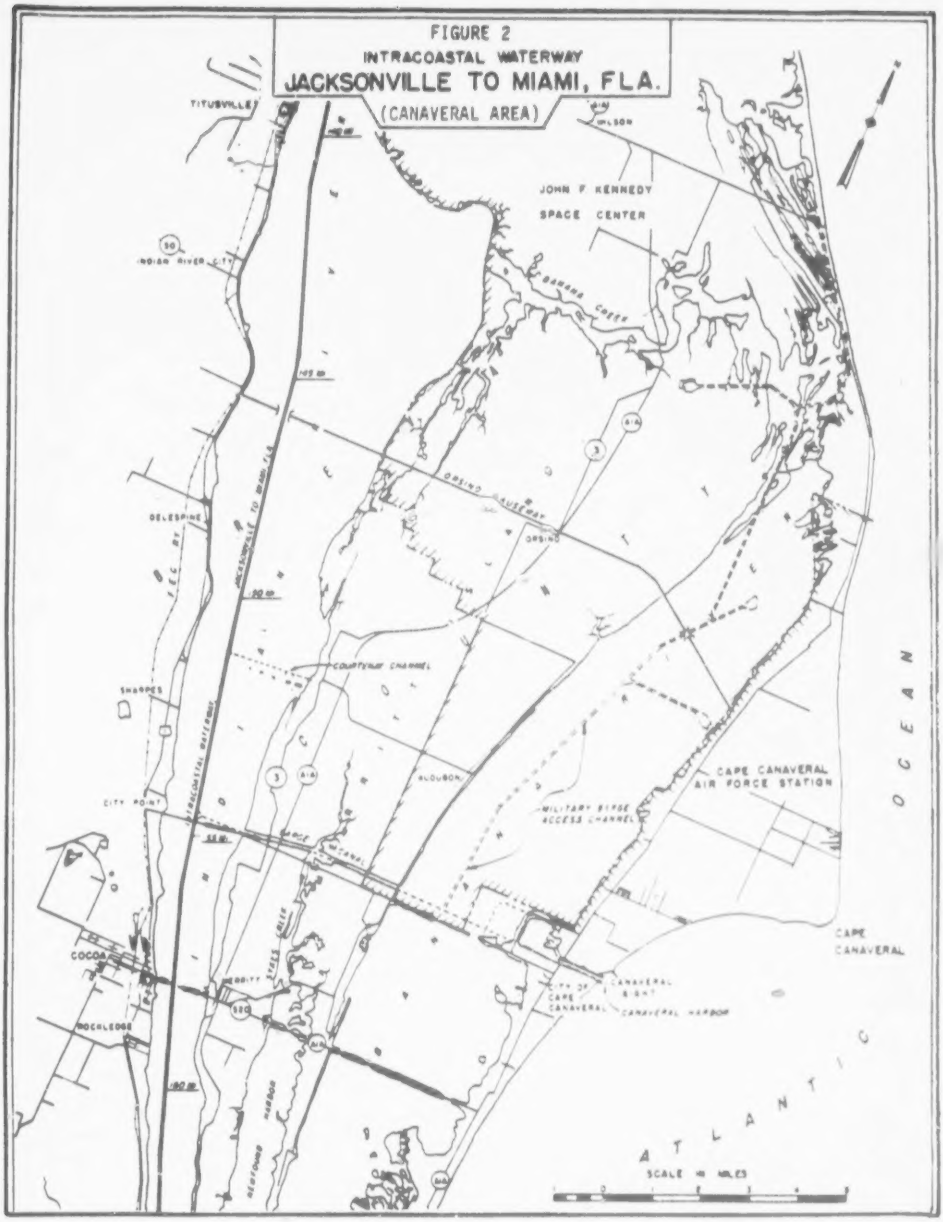
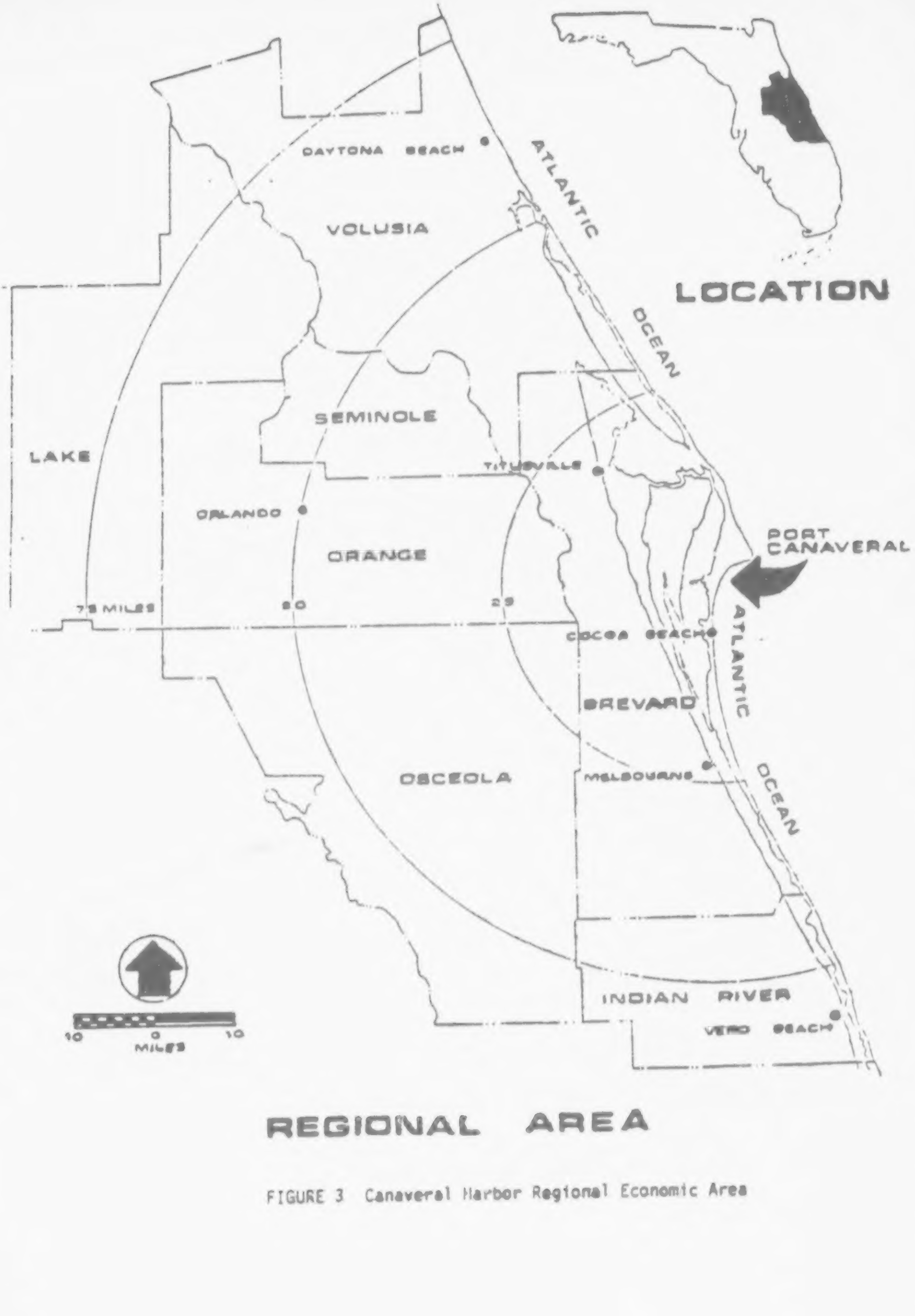


FIGURE 2
INTRACOASTAL WATERWAY
JACKSONVILLE TO MIAMI, FLA.
(CANAVERAL AREA)

TITUSVILLE
WILSON
A1A
JOHN F KENNEDY
SPACE CENTER
50
INDIAN RIVER CITY
BANANA CREEK
3
A1A
ORSINO CAUSEWAY
ORSINO
DELESPINE
F.E.C. RY
JACKSONVILLE TO MIAMI, FLA.
COURTENAY CHANNEL
SHARPES
INTRACOASTAL WATERWAY
INDIAN RIVER
MERRITT ISLAND
BANANA RIVER
3
A1A
AUDUBON
CAPE CANAVERAL
AIR FORCE STATION
MILITARY BARGE
ACCESS CHANNEL
CITY POINT
BARGE CANAL
COCOA
MERRITT
SYKES CREEK
520
A1A
ROCKLEDGE
NEWFOUND HARBOR
CITY OF
CAPE
CANAVERAL
CANAVERAL
BIGHT
CANAVERAL HARBOR
CAPE
CANAVERAL
ATLANTIC
OCEAN
A1A
SCALE IN MILES
1 0 1 2 3 4 5


LOCATION
DAYTONA BEACH
ATLANTIC
VOLUSIA
OCEAN
SEMINOLE
LAKE
TITUSVILLE
ORLANDO
ORANGE
PORT CANAVERAL
75 MILES
50
25
COCOA BEACH
ATLANTIC
BREVARD
OSCEOLA
MELBOURNE
OCEAN
INDIAN RIVER
VERO BEACH
10
0
10
MILES

REGIONAL AREA

FIGURE 3 Canaveral Harbor Regional Economic Area

NATURAL FORCES AFFECTING THE STUDY AREA

Waves

The waves that occur in the vicinity of the study area consist of "sea"and "swell". Local seas are waves generated by local winds and are observed traveling with the wind. Swells are waves generated from distant storms or open ocean prevailing winds that enter the study area independent of local winds. Waves and swells generally have no effect on deep draft navigation due to their small amplitude and short period; however, allowances in depth have to be considered for those times when adverse conditions prevail.

Tides

There are two basic types of tides that occur in the ocean near the study area. The astronomical tides are primarily the result of gravitational forces of the moon and sun, centrifugal forces due to the movement of the earth in its orbit, coriolis forces due to the earth rotating about its axis, and the frictional force due to the movement of the water with respect to its boundaries. The theoretical astronomical tides in the study area are predictable; however, the effects of onshore/offshore winds in depressing the theoretical high and low tide levels or causing tide set-up and/or tide cycle lag are not predictable.

Tides in the study area are semidiurnal; that is two high and two low waters occur each day. The mean tidal range in the Atlantic Ocean at Canaveral Bight is 3.4 feet. The spring tidal range is 4.1 feet. All elevations, depths and water levels in this report refer to mean low water datum which is 1.9 feet below mean sea level (1929 NGVD). During severe onshore winds, tides 4 to 6 feet are not uncommon. Extremely high wind velocities coupled with very low barometric pressures (tropical depressions or hurricane conditions) have caused tides as high as 9 to 10 feet above mean low water on the Atlantic coast of Florida.

Currents

No velocity records are available on the measurement of currents in Canaveral Harbor or along the ocean shore of Brevard County. Currents in the ship channel are negligible due to the small tidal prism at Canaveral Harbor. Winds, waves and vessel traffic produce localized currents in the harbor. The University of Florida Coastal and Oceanographic Engineering Laboratory published a Florida Coastal Data Network Special Issue, Directional Wave Measurement, Cape Canaveral, Florida in 1984. Data were for May and June 1984. The maximum mean current for that period was 2.5 feet per second.

EXISTING ENVIRONMENTAL CONDITIONS

Port Canaveral was constructed on filled land and wetlands between the Atlantic shoreline and the Banana River as a Federal project first authorized in 1945 and expanded under congressional authorization in 1962. A barge canal, which serves the port, connects it with the Banana River and the Intracoastal Waterway by means of a lock that serves as a salinity control barrier. Entrance to the port is from Canaveral Bight via a dredged access channel and artificial cut through the barrier island to the port harbor and turning basins. The eastern most end of the port is devoted to military accommodations on its northern side and a public park and cruise ship docks on the south. Commercial structures including oil storage, cement transfer facilities, coal storage, general warehousing, and commercial fish processors occupy the central reach of the port. Fish houses and a marina border the southern boundary of the barge channel near the west basin. Extensive deepening and lengthening of the entrance channel to the port has been accomplished to serve the Trident submarine base.

Wildlife present in the area include a wide variety of shore and sea birds, small mammals, amphibians and fishes. The entire port area is a manmade facility, dredged many times and having no significant environmental resources (USFWS, letter September 22, 1989).

Most of the upland within the project area is on filled land with sparse vegetation consisting of annual pioneer species, shrubs, scrub plants, and Florida grasses. The vegetation includes Brazilian pepper, cabbage palm, scrub oak, saw palmetto, Australian pine, sand spur, prickly pear, wild lantana, Coral-bean, sea purslane, stagger bush and similar species. No significant wildlife habitat is present.

The Corps of Engineers, in coordination with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, have identified the bald eagle, peregrine falcon, wood stork, manatee, and several species of sea turtles as possibly occurring in the area. In addition, several species of whales may occur in the vicinity of the offshore disposal area, at least seasonally. There is no designated critical habitat in the area.

The National Register of Historic Places does not list any sites within the project area. The nearest registered site is Launch Complex 39 at the Kennedy Space Center 14 miles to the north. The National Register of Natural Landmarks shows no designated landmarks within Brevard County, but consideration is being given to recommending the inclusion in the Register of the Cape Canaveral area because it is a geological formation that significantly illustrates geologic processes. Merritt Island National Wildlife Refuge, Kennedy Space Center, and various military installations are located to the north of the port. The State Historic Preservation Officer agreed there are no known sites in the area and no potential for locating any.

HUMAN RESOURCES

Human resources of the primary study area include the population of Brevard County. The populations of Cocoa Beach, Melbourne and Titusville are included in the Brevard County population. The 1980 Census showed a Brevard County population of 273,000, an increase of 19 percent from the 1970 population of 230,000. For the secondary study area, the Orlando MSA, the 1980 Census showed a population of 701,000, an increase of 55 percent from the 1970 population of 453,000 For the entire state of Florida the 1980 population was 9,740,000, an increase of 43 percent from the 1970 population of 6,792,000. Historical and projected populations are shown in table 2.

TABLE 2

PROJECTED POPULATION OF STUDY AREA
1990-2040
(thousands of people)

	1990	2000	2010	2020	2030	2040
Primary Study Area						
Brevard County	322.7	365.3	405.5	451.1	491.7	535.9
Secondary Study Area						
Orange County	569.9	643.4	714.8	794.9	866.6	944.9
Osceola County	65.9	77.3	87.0	97.0	106.0	115.8
Seminole County	248.0	291.9	327.6	365.1	398.1	434.1
TOTAL	883.8	1,012.6	1,129.4	1,257.0	1,370.7	1,494.8
Tertiary Study Area						
State of Florida	11,690.1	13,259.0	14,717.9	16,354.1	17,814.7	19,405.9

Source: OBERS projections.

DEVELOPMENT AND ECONOMY

Employment and income are important indicators of trends in the development and economy of the study area. From 1940 through 1980 Brevard County has shown steady gains in employment and in income. The largest gains have been in the service industry. This same pattern is evident in historical trends in income and employment for the secondary study area and for the State of Florida. Historical employment and income by industry is shown in table 3 for Brevard County, table 4 for the secondary study area, and table 5 for the State of Florida.

TABLE 3

EMPLOYMENT AND INCOME
PRIMARY STUDY AREA (BREVARD COUNTY)
1940-1980

	1940	1950	1960	1970	1980
EMPLOYMENT					
Construction	572	787	4,488	4,300	6,640
Manufacturing	282	428	10,056	8,136	17,894
Wholesale & Retail	402	2,136	729	1,979	2,468
FIRE*	116	214	1,166	3,222	4,839
Services	1,608	2,039	11,082	30,376	24,456
Government	189	1,186	5,905	22,264	23,573
Others	2,831	2,033	8,915	29,765	27,245
TOTAL	6,000	8,823	42,341	100,042	107,115
PERSONAL INCOME**					
Construction	N/A	N/A	22,952	39,592	62,752
Manufacturing	N/A	N/A	53,536	252,776	218,293
Wholesale & Retail	N/A	N/A	25,547	16,675	21,954
FIRE*	N/A	N/A	6,255	26,536	37,271
Services	N/A	N/A	76,164	301,225	209,897
Government	N/A	N/A	23,670	181,487	209,435
Others	N/A	N/A	11,474	188,341	533,926
TOTAL	N/A	N/A	219,598	1,006,632	1,293,528

* In thousands of nominal dollars.
** Finance, Insurance & Real Estate

TABLE 4

EMPLOYMENT AND INCOME
SECONDARY STUDY AREA (BREVARD COUNTY & ORLANDO MSA)
1940-1980

	1940	1950	1960	1970	1980
EMPLOYMENT					
Construction	2,738	5,783	17,602	16,836	22,051
Manufacturing	3,705	5,548	29,213	32,460	53,059
Wholesale & Retail	4,441	7,266	6,410	13,248	20,297
FIRE*	1,486	2,670	7,624	13,468	25,763
Services	12,796	16,203	39,928	72,724	114,879
Government	1,212	3,236	19,996	58,601	79,825
Others	19,142	25,401	46,550	83,405	112,511
TOTAL	45,520	66,107	167,323	290,742	428,385
PERSONAL INCOME**					
Construction	N/A	N/A	84,471	141,788	196,675
Manufacturing	N/A	N/A	154,990	492,927	585,857
Wholesale & Retail	N/A	N/A	203,369	124,440 1/	207,619
FIRE*	N/A	N/A	43,500	122,106	225,137
Services	N/A	N/A	148,914	559,004	840,452
Government	N/A	N/A	69,757	430,459	655,933
Others	N/A	N/A	104,355	956,555	2,032,704
TOTAL	N/A	N/A	809,356	2,827,279	4,744,377

* In thousands of nominal dollars.
** Finance, Insurance & Real Estate
1/ Does not include all income due to non-disclosure of confidential information.

TABLE 5

EMPLOYMENT AND INCOME
STATE OF FLORIDA
1940-1980

	1940	1950	1960	1970	1980
EMPLOYMENT					
Construction	44,434	92,052	124,000	175,700	263,900
Manufacturing	81,143	109,877	207,500	322,500	452,470
Wholesale & Retail	30,275	49,500	349,700	136,044	203,466
FIRE*	20,971	38,551	82,100	131,300	254,200
Services	186,586	249,017	227,700	416,200	811,300
Government	28,571	93,670	220,500	397,800	618,800
Others	291,020	418,250	109,100	572,556	972,064
TOTAL	683,000	1,050,917	1,320,600	2,152,100	3,576,200
PERSONAL INCOME**					
Construction	N/A	N/A	786,000	1,430,000	2,347,642
Manufacturing	N/A	N/A	995,400	2,374,000	4,394,570
Wholesale & Retail	N/A	N/A	1,699,200	1,267,000	2,121,054
FIRE*	N/A	N/A	563,000	1,386,400	2,440,315
Services	N/A	N/A	1,178,800	2,509,000	6,880,128
Government	N/A	N/A	927,300	3,548,000	5,808,747
Others	N/A	N/A	1,127,300	15,464,600	38,957,000
TOTAL	N/A	N/A	7,277,000	27,978,000	62,949,456

* In thousands of nominal dollars.
** Finance, Insurance & Real Estate

In April of 1989 a report titled *The Impact of Port Canaveral on the Economies of Brevard County and the Central Florida Region* was prepared by the Department of Economics, College of Business Administration of the University of Central Florida. That report discusses sources of impact and addresses the results of input/output modeling to assess both direct and indirect impacts of the port. The following paragraphs on the Development and Economy are excerpted from that report.

Sources of Impact - The Cruise Industry

Central Florida's high concentration of tourist attractions has made Port Canaveral the port of choice for the world's number one tourist destination. When Walt Disney World opened in 1971, there was an influx of cruise ship activity as passenger demand for port calls in Central Florida skyrocketed. By 1982, Port Canaveral had become a cruise port in its own right when one-day sailings, called "Cruises To Nowhere", were first offered. While 186,000 passengers went cruising to nowhere in the first year, by 1987 the number of passengers had mushroomed to 724,000. The S.S. Atlantic will boost the total projected passengers for 1989 to 912,000. These passengers will contribute to Port Canaveral's pursuit toward becoming the second largest cruise port in the country. The addition of two more ships by 1990 will help Port Canaveral eclipse Port Everglades in the near future.

The impact of the cruise industry on the area's economy is derived from purchases made by both the industry and its passengers. When combined, these purchases inject over $287 million per year into the local economy. The industry itself spends $53.7 million, with the largest amount ($16.6 million) paid as wages and salaries.

With over 1,900 employees (1,640 shipboard and 275 shoreside), the cruise industry is the largest single employer at the Port. In addition, to its purchase of manpower, the industry spends $37 million outfitting their ships and buying the services necessary for operations. Nearly half of all cruise industry purchases were for fuel and for merchandise to be resold on ship.

In addition to direct purchases by the cruise industry, a second and larger source of impact is generated by visitor spending. According to the "Florida Visitor Study, 1986" conducted by the Florida Department of Commerce, the average cruise ship passenger spends $225 per day in the port of embarkation/debarkation and visits the port area for one and one-half days. Over the past two years, an average of 692,269 cruise ship passengers passed through Port Canaveral, each spending an average of $337.50 during their stay and contributed $233.7 million to the local economy. The three types of businesses that benefit most are lodging, restaurant dining and entertainment.

Sources of Impact - Cargo Movements

The completion of the limited-access Beeline Expressway in the 1970's linked Port Canaveral to the warehousing and office/industrial park districts of the Orlando metropolitan area, just 50 miles away. Since that time, the port has become Central Florida's most important connection to the international economy. The flow of cargo through the port continues to grow at record levels. In fiscal year 1988, cargo passing through the port topped 2.61 million tons.

The movement of such a vast amount of cargo requires the coordination of many port-related activities. Over 730 jobs are directly associated with cargo movement. These jobs are concentrated in piloting and towing, warehousing, trucking and stevedoring.

Sources of Impact - The Port Authority

The Canaveral Port Authority (CPA) is a self-sufficient, quasi-governmental entity. User fees completely finance the port's development plans and community services. In fiscal year 1988, the CPA generated over $6.7 million in revenues. Not surprisingly, the most important sources of CPA revenue were those derived from passenger ($2.9 million) and cargo flows ($2.5 million). Half of the Port authority's revenues are used to pay salaries and benefits to its 77 employees, to service the debt on past development projects, for marketing and public relations, and for maintenance and repair of existing facilities. The remaining funds are used to finance new capital projects. Over the past five years capital spending has averaged $3.5 million annually. The largest component of capital spending was for new building construction ($1.8 million), including offices, cruise terminals and warehouses. The next largest category was spending on pier construction, and the dredging of channels and harbors (over $1 million).

Recently the Port Authority has embarked on an even more ambitious 15 year expansion plan. Before 1992, the Port Authority will spend a total of $17.8 million on the West Turning Basin, the Foreign Trade Zone and Canaveral Cove. These projects will push the port's capital spending far beyond past levels. The impact of the port's development program on both local and regional economies can, therefore, be expected to grow.

Sources of Impact - Other Sources of Impact

A number of other important sources of economic impact at the port cannot be overlooked. One such source is the Federal government. With Kennedy Space Center just to the north, the port has always been an important component in the water transportation system of the space program. The high concentration of aerospace activity in Brevard County gave the port a natural advantage as a testing site for missile weapon systems. The port serves the area's military installations and the trident submarine operation and is a major cargo center serving U.S. forces in the Bahamas and the Caribbean. Canaveral is also home port to four Coast Guard cutters, and there are resident customs, agricultural, and immigration officials to facilitate the flow of international commerce. All these activities combine to make the Federal government the second largest employer at the port, providing over 1,000 jobs.

In addition to Federal government operations, the port has a number of other private industries and businesses. The boat/ship building and repair industry provides over 900 jobs. Marinas, charter boats, restaurants, marine suppliers, and engineering/surveying companies increase the impact of the port by adding a combined total of 278 jobs to the local economy.

The Direct Impact - Measuring the Port's Economic Impact

The impact of Port Canaveral on the county and regional economies was estimated for fiscal year 1988. The total impact was measured using the millions of dollars injected into the local economy by private industry, the Federal government, cruise ship passengers and the Port Authority. The complex set of interactions that were stimulated by these sources of impact were identified and accumulated to determine the total effect on both the county and the region's employment, income and production.

The Direct Impact - Direct Effects on Brevard County's Economy

Using the jobs and purchases of the three major sources of economic impact, detailed estimates were made of the way Port Canaveral directly affects Brevard County businesses. The port added $452 million in production, $145 million in wages and 22,670 jobs to the Brevard County economy. (Table 6 provides a summary of the direct affects by broad industry category.)

TABLE 6

ECONOMIC IMPACT OF PORT CANAVERAL
DIRECT IMPACTS ON BREVARD COUNTY - BROAD CATEGORIES
(in millions of dollars)

Industry	Dollar Impact
Services	115.25
Retail Trade	111.92
Transport/Utilities	91.88
Agri. Serv./Fishing	72.03
Manufacturing	32.40
Construction	3.34

Within these broad categories, an estimated 25 separate sectors were directly affected by the port. These individual sectors and the magnitude of their direct effects are presented in table 7. Eighty-six percent of direct purchases were generated within four broad sector categories: Services, Retail, Transportation/Utilities/Communication, and Agricultural Service/Forest/ Fishing. The largest impact in the Service sector was from Hotel and Lodging, while the largest impact in the Retail sector was from Eating and Drinking places. These impacts reflect the importance of cruise passenger spending. In the Agricultural Service/Forest/Fishing sector, Commercial fishing accounted for all of the direct impact. This demonstrates the significant contribution of the scallop industry.

TABLE 7

ECONOMIC IMPACT OF PORT CANAVERAL
DIRECT EFFECTS ON BREVARD COUNTY - DETAILED CATEGORIES
(in thousands of dollars)

Industry	Dollar Impact
HOTELS & OTHER LODGING	80,450.7
COMMERCIAL FISHING	72,028.8
WATER TRANSPORTATION	64,267.8
EATING & DRINKING PLACES	59,466.0
TRANSPORTATION EQUIPMENT	32,250.0
AMUSEMENT AND RECREATION	31,165.9
GOVERNMENT	25,483.3
MISCELLANEOUS RETAIL	22,701.8
TRANSPORTATION SERVICES	19,139.6
FOOD STORES	14,128.6
AUTO DEALERS-SERV.STAT.	9,931.4
TRUCKING & WAREHOUSING	8,457.0
BLGD. MATERIAL-GARDEN SUPPLY	5,694.3
HEALTH SERVICES	2,435.3
GENERAL BLDG. CONTRACTORS	1,768.8
HEAVY CONST. CONTRACTORS	1,340.2
MISCELLANEOUS SERVICES	683.2
LEGAL SERVICES	510.0
SPECIAL TRADE CONTRACTORS	229.9
MACHINERY, EXCEPT ELEC.	211.0
ELECTRIC & ELEC. EQUIP.	23.3
GREENHOUSE & NURSERY PROD.	17.3
ELEC., GAS & SANITARY SERV.	12.1
MISC. MANUFACTURING	8.0
TOTAL	452,404.3

Multiplier Effects - The Port Multipliers

The port not only provided jobs and income in the sectors directly affected, but also stimulated a set of broad economic interactions that produced additional jobs and income within Brevard County and throughout the Central Florida region. These indirect effects arose as the directly affected industries purchased their supplies from other businesses within the county and region. The secondary supplying firms, in turn, had to buy more production inputs from their suppliers and labor services from households. This second round of purchases led to a third round of material and labor purchases which caused a fourth round, etc. Each of the rounds of economic transactions added to the total production, employment and household income both within the county and the region. The summation of secondary, tertiary, etc. rounds indirect economic interactions constitutes the port's multiplier effect.

The overall multipliers were calculated for Port Canaveral using detailed computer models (i.e. 494 sector input-output models) of the structure of the Central Florida region, and Brevard County. The multipliers for the county indicate that each direct job produced by the port was actually multiplied by 1.38 total jobs within the county. The output multiplier indicates that each $1 of output produced by the port itself required an additional $.55 in supporting production from other parts of the county's economy. Finally, each $1 of wages paid by the port generated an additional $.57 in wages in the county. When the larger Central Florida region (i.e. Brevard, Orange, Osceola and Seminole Counties) is considered, the Port has an even more dramatic effect. Each direct job was multiplied by 1.59 jobs in the region, every dollar of direct production required $.77 more in regional production and each dollar of direct wages resulted in $.79 in additional wages in Central Florida.

The Total Impact - County and Regional Impact

The total estimated impact of the port on Brevard County was over $709 million in production, $225 million in wages, and 31,177 jobs. This means that over one-fifth of the county's employment can be attributed to the direct and indirect effects of Port Canaveral. The port also generated $55 million in taxes for local governments in the county and $7.6 million for the state. At the regional level, the impact of the port was over $835 million in production, $263 million in wages, and 31,900 jobs. An additional $14 million in local tax revenues and $1.3 million in state tax revenues were generated when the study was expanded to the regional level.

Table 8 shows how the port impacted the major industrial sectors of the Brevard County economy. Over 78 percent of the total impact was attributed to four sectors. The three largest impacts were on the Service sector, the Retail Trade sector and Transportation/Utility/Communication sector. In these sectors over three-fifths of the impact was attributable to the direct impact of the port. The fourth strongest impact was on the Agricultural Services/Forest/Fishing sector, of which 96 percent was direct impact of the commercial fishing industry.

TABLE 8

ECONOMIC IMPACT OF PORT CANAVERAL
TOTAL IMPACTS ON BREVARD COUNTY - BROAD CATEGORIES
(in millions of dollars)

Industry	Dollar Impact
Services	184.12
Retail Trade	154.47
Transport/Utilities	139.60
Agri. Serv./Fishing	75.22
Fin./Ins./Real Est.	52.06
Manufacturing	43.17
Wholesale Trade	13.02
Construction	13.10
Other	3.03

The Total Impact- Individual Sectors Most Affected by the Port

The dollars injected into Brevard County's economy by the port's activities had a wide-ranging impact. Many individual sectors were touched to one extent or another. There were, however, some types of firms that were more strongly affected than others. Table 9 lists the individual firm types that experienced the largest total impacts from port activities. The impacts for these detailed sectors are divided into indirect and direct components to emphasize the role of multiplier effects in determining each sector's total impact.

Fifteen separate firm types received total impacts in excess of $10 million, and four industries received impacts in excess of $72 million. The latter included Hotels and Other Lodging, Water Transportation, Eating and Drinking places, and Commercial Fishing. The impacts are not surprising since these are the sectors which are most affected by cargo\passenger flows and the scallop industry.

The largest indirect impact was in the Real Estate industry. The increases in residential purchases were induced by the expansion of Brevard County income. Commercial real estate purchases increased because of the growth that occurred in the county's economy as a result of inter-industry transactions stimulated by the port.

When the analysis is extended to the larger economy of Brevard, Orange, Osceola and Seminole Counties, all of the individual sectors affected in Brevard County are further stimulated. Table 9 also shows the magnitude of the change in the affects on individual firm types at the regional level. The firm types receiving the largest additional impacts from the port were Hotels ($15.9 million), Durable Good Wholesale ($11.2 million), and Trucking and Warehousing ($8.2 million). Hotels receive a large additional impact since many cruise passengers take the time to visit Central Florida's attractions. The importance of the port in linking the Orlando area to the world economy is reflected by the additional impact to the distribution trades industries.

TABLE 9

ECONOMIC IMPACT OF PORT CANAVERAL
DIRECT, INDIRECT AND TOTAL EFFECTS
BREVARD COUNTY AND CENTRAL FLORIDA REGION - DETAILED CATEGORIES
(in millions of dollars)

Industry	Brevard County Direct	Brevard County Indirect	Brevard County Total	Central Florida Total	Net Increase
HOTELS & OTHER LODGING	80.5	1.8	82.3	98.2	15.9
WATER TRANSPORTATION	64.3	10.1	74.4	78.4	4.0
EATING & DRINKING PLACES	59.5	13.3	72.7	75.0	2.3
COMMERCIAL FISHING	72.0	0.2	72.2	78.6	6.4
AMUSEMENT AND RECREATION	31.2	5.0	36.2	36.4	0.2
REAL ESTATE	0.0	35.5	35.5	42.3	6.8
TRANSPORTATION EQUIPMENT	32.3	0.9	33.1	34.3	1.2
MISCELLANEOUS RETAIL	22.7	5.6	28.3	33.6	5.3
ELEC., GAS & SANITARY SERV.	0.0	23.9	23.9	29.4	5.5
TRANSPORTATION SERVICES	19.1	1.3	20.5	20.6	0.1
HEALTH SERVICES	2.4	16.7	19.1	23.2	4.1
BUSINESS SERVICES	0.0	18.1	18.1	21.3	3.3
AUTO DEALERS-SERV.STAT.	9.9	8.1	18.0	19.8	1.8
FOOD STORES	14.1	3.6	17.7	18.3	0.6
TRUCKING & WAREHOUSING	8.5	1.6	10.1	18.4	8.3
SPECIAL TRADE CONTRACTORS	0.2	9.8	10.0	11.3	1.3
COMMUNICATION	0.0	8.8	8.8	12.9	4.1
BLGD. MATERIAL-GARDEN SUPPLY	5.7	3.0	8.7	10.2	1.5
AUTO REPAIR, SERV., GARAGES	0.0	8.1	8.1	10.2	2.1
WHOLESALE-NONDURABLE GOODS	0.0	7.8	7.8	14.2	6.3
BANKING	0.0	6.7	6.7	9.1	2.4
GENERAL MERCH. SERVICES	0.0	5.5	5.5	6.5	1.0
PERSONAL SERVICES	0.0	5.4	5.4	7.6	2.2
WHOLESALE-NONDURABLE GOODS	0.0	5.2	5.2	14.2	6.3
PRINTING AND PUBLISHING	0.0	5.1	5.1	9.3	4.2
CREDIT AGENCIES AND EX. BANKS	0.0	5.0	5.0	5.0	0.0
MISCELLANEOUS SERVICES	1.1	2.9	4.0	5.6	1.6
TOTAL	423.4	219.0	642.4	746.0	103.8

PORT FACILITIES

Canaveral Harbor's impact region includes the greater Orlando area, whose highway, rail and air transportation systems make it the major distribution center in the region. The four-lane, limited access Beeline Expressway (S.R. 528), S.R. 520 and S.R. 50 provide a direct link to the Orlando market area. Those highways intersect with Interstate 4, the Florida Turnpike, U.S. routes 17, 92, 441 and numerous state and local highway systems providing excellent east-west highway access. The Beeline Expressway (S.R. 528 intersects with the major north-south highways of Interstate 95 and U.S. 1 twelve to fifteen miles west of the Port entrance providing an excellent link with Canaveral's northern and southern market area.

BThe port is served by the Florida East Coast Railroad from a recently completed piggy-back facility. The facility is located at the Beeline Industrial Park (S.R. 528 and Clear Lake Road) twelve miles west of the port via the Beeline Expressway (S.R. 528). The inland transportation system which serves the port is shown in figure 4.

The port is served by the Orlando International Airport, the Space Center Executive Airport in Titusville, the Melbourne Regional Airport and the Daytona Beach Airport whose link with the port area is via the Beeline Expressway (S.R. 528), U.S. 1 and Interstate 95, respectively.

The port owns 757 acres of land for existing and future development. Figure 5 displays and table 10 lists the existing port marine and upland facilities. The listing includes port owned and privately owned facilities on land leased from the port. The port leases about 192 acres of land to various marine commercial/industrial uses.

EXISTING CHANNEL IMPROVEMENTS

Since 1945 the Federal government has supported development of navigation improvements for Canaveral Harbor. Since that time, navigation improvements have been made by both Federal and non-Federal interests. Figure 1 shows the presently authorized channel dimensions and depths. The project provides for an entrance channel with the outer reach 37 feet deep and 400 feet wide and the inner reach 36 feet deep and 300 feet wide to the middle turning basin. The authorized depth of the middle turning basin is 35 feet. The project also provides for a channel 31 feet and 400 feet wide from the middle turning basin to the west turning basin. The authorized dimensions of the west turning basin are 31 feet deep in an area with a 1,400 feet turnning diameter. Local interests completed the deepening of the west access channel and west turning basin from the authorized 31 feet to 35 feet in May 1987. The existing harbor channels are shown on plate 1.

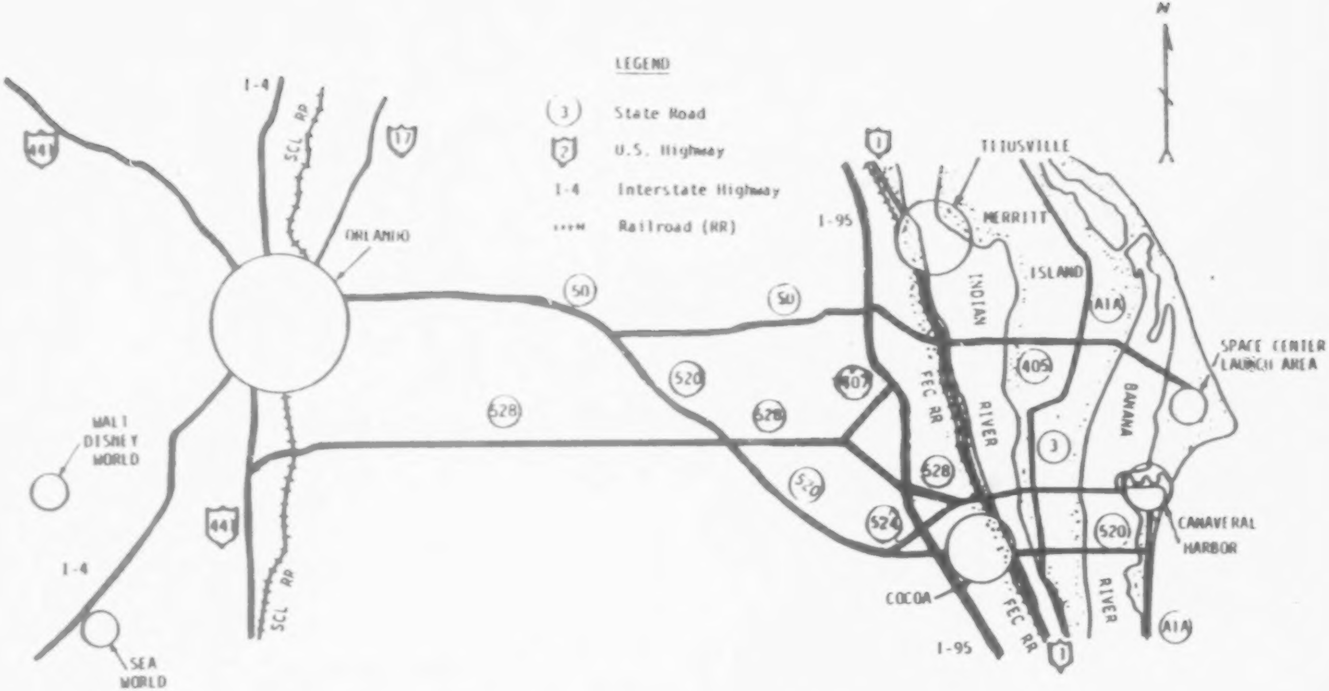

N
LEGEND
3 State Road
2 U.S. Highway
I-4 Interstate Highway
Railroad (RR)
I-4
SCL RR
17
441
ORLANDO
WALT DISNEY WORLD
SEA WORLD
I-4
441
SCL RR
50
50
520
528
528
407
520
524
528
I-95
1
TITUSVILLE
MERRITT
ISLAND
INDIAN
RIVER
FEC RR
A1A
405
3
BANANA
RIVER
520
SPACE CENTER LAUNCH AREA
CANAVERAL HARBOR
COCOA
I-95
FEC RR
1
A1A

FIGURE 5 Land Transportation System

TABLE 10

EXISTING PORT FACILITIES
CANAVERAL HARBOR 1989

Cargo Piers

North Side	
Two piers	400 ft. X 50 ft. X 35 ft. deep
One pier	1,140 ft. X 50 ft. X 35 ft. deep
South Side	
Marginal wharf	1,160 ft. X 35 ft. deep, plus 160 ft. X 20 ft. deep
Tanker Berths	Two dolphin-type berths, 35 ft. deep

Cruise Ship Terminals

Cruise Terminal No. 2	500 ft. X 35 ft. deep
Cruise Terminal No. 3	550 ft. X 41 ft. deep
Cruise Terminal No. 4	370 ft. X 34 ft. deep

Small Boat Facilities

Five marinas	6,730 linear ft. of bulkhead

Storage Facilities

Port-owned warehouses	174,000 sq. ft. (4.0 acres)
Privately-owned warehouses	240,000 sq. ft. (5.5 acres)
Special storage facilities	
Cement storage	70,000 tons
Petroleum storage	
Florida Power and Light	268,000 barrels
Orlando Public Utilities	325,000 barrels
Canaveral Corporation	820,000 barrels
Open storage	7,797,240 sq. ft. (179 acres)
Paved storage	435,600 sq. ft. (10 acres)

Note: 140,000 square feet of warehouse space is refrigerated and conversion of another 90,000 square feet to refrigeration is authorized.

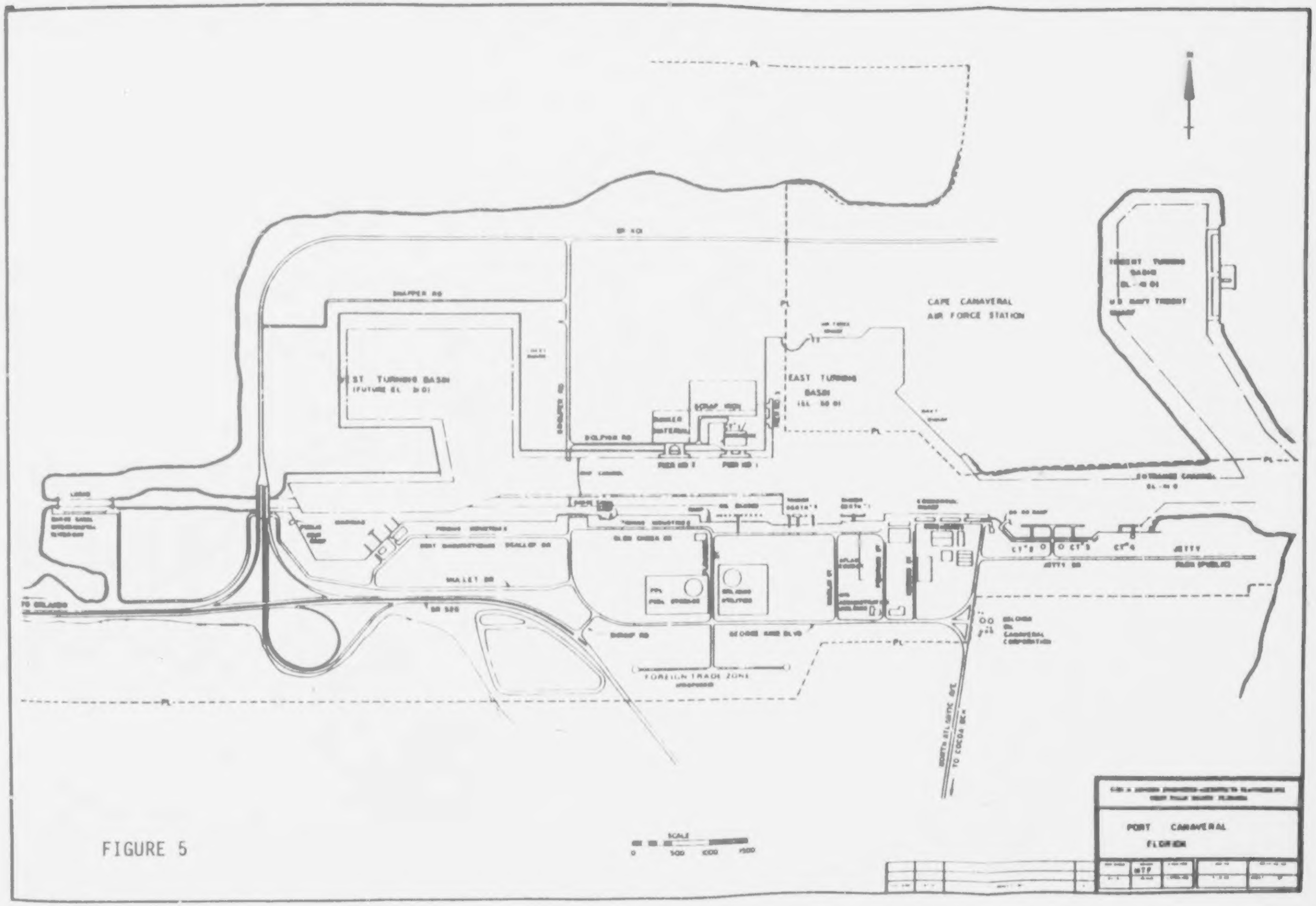

CAPE CANAVERAL
AIR FORCE STATION
EAST TURNING
BASIN
ST TURNING BASIN
SNAPPER RD
DOLPHIN RD
SCRAP IRON
BANKER
MATERIAL
PIER NO 1
PIER NO 2
GLEN CHEEK DR
MALLET DR
SR 528
GEORGE KING BLVD
FOREIGN TRADE ZONE
CT 2
CT 3
CT 4
JETTY RD
JETTY
PARK (PUBLIC)
ENTRANCE CHANNEL
NORTH ATLANTIC AVE
TO COCOA BCH
TO ORLANDO
PL
SCALE
0
500
1000
1500
PORT CANAVERAL
FLORIDA

FIGURE 5

TRAFFIC

Current traffic at Canaveral Harbor is mostly small boats with drafts of 18 feet or less but the annual trips has declined significantly since 1980. In 1986-87 those vessels made about 70 percent of the total trips recorded in the harbor as shown in the following tabulation. The larger passenger and dry cargo vessel trips had the greatest increase since 1980 mainly from cruise ship traffic.

	Annual vessel trips				
Item	1980	1982	1984	1986	1987
Vessel drafts 18 feet or less	2,931	1,130	804	904	900
Vessel drafts 19 feet or more:					
Passenger or Dry Cargo	73	123	220	290	332
Tanker	47	42	66	49	53
Barge	10	9	12	6	11
Subtotal	146	174	298	345	396
Total	3,077	1,304	1,102	1,249	1,296

FUTURE CONDITIONS

Canaveral Harbor is a dynamic and expanding port. Additional construction planned by the port includes a new cruise ship terminal adjacent to the west turning basin, extension of cargo piers, construction of additional warehouses and other capital improvements. Improvements are planned to accommodate increases in passengers and in cargo tonnage in the future; however, the projected increases in cargo tonnage detailed in this report are not dependent on those improvements. Construction of the new passenger terminal is scheduled for completion in 1990 and is, therefore, considered part of the existing project. For the above reasons, existing and future port conditions are considered equivalent for the remainder of this report. Projected cargo tonnage and cruise ship passengers are summarized in table 11.

TABLE 11

PROJECTED PASSENGERS AND CARGO TONNAGES
CANAVERAL HARBOR, 1993-2043

Year	Projected Tonnage	Projected Passengers
1993	2,789,000	1,500,000
2003	3,456,400	N/A
2013	3,641,300	N/A
2023	3,830,400	N/A
2033	4,040,600	N/A
2043	4,254,000	N/A

Source: Projected tonnage from studies performed by the U.S. Army Corps of Engineers for this report. Projected passengers from Port Canaveral Comprehensive Plan, December 1987 prepared by Gee & Jenson, Inc.

PLAN FORMULATION

PROBLEMS, NEEDS AND OPPORTUNITIES

The opportunities, problems, needs and concerns of the study area determined the direction of the study effort. Definition of those opportunities was a major task in the consideration of navigation improvements at Canaveral Harbor. During the course of the study, local navigation interests identified problem areas for development of potential solutions. The identified problems included inadequate channel depths limiting vessel drafts and safety concerns associated with existing channel widths. Opportunities for assuming maintenance of deeper depths provided by local interests in the West Basin and access channel were also identified. Considered improvements to address those concerns included deepening the existing project, widening the Inner Entrance Channel, and providing a bend widener to the West Basin.

The Canaveral Port Authority also identified opportunities for recreation associated with harbor improvements. Two sites, the south jetty and the area immediately adjacent to the barge canal lock, had apparent potential for recreational development at Canaveral Harbor. Improvements were considered for both of those sites.

Imports and exports of bulk commodities at Canaveral Harbor are increasing along with an expanding cruise ship industry. Bulk commodities are reaching such proportions that large ships transporting those commodities cannot be loaded to their most economical drafts because of the limitations of the existing channel depths. The smaller vessels which are able to call Canaveral Harbor at fully loaded drafts are becoming a smaller proportion of the world fleet and thus more difficult to charter. Light-loading deeper draft ships has become necessary to enable those vessels to call at Canaveral Harbor under existing conditions.

In 1960-1962 when the currently authorized harbor project was under consideration, the design vessels were T-2 tankers (16,700 DWT) and 19,000 DWT tankers. Those ships had lengths of 520 to 560 feet, drafts of 30 to 32 feet, and beams of 70 to 75 feet. In 1988 the larger dry bulk carriers calling at Canaveral ranged from 30,000 to 45,000 DWT and tankers ranged from 28,000 to 67,000 DWT. The dimensions of the dry bulk vessels ranged from 510 to 700 feet in length, 75 to 103 feet in beam and 32 to 39 feet in maximum draft. The tankers' dimensions ranged from 560 to 750 feet in length, 75 to 106 feet in beam and 34 to 42 feet in maximum draft.

In addition to greater channel depths to increase the carrying capacities of the larger vessels, local interests desire a wider channel from the Navy's Trident submarine basin to the middle turning basin (from the existing 300-foot width to 400 feet) to enable safer handling of the larger vessels. The entrance channel and the west access channel at Canaveral harbor are already 400 feet wide.

The Canaveral Pilots Association provided information describing the problems associated with inadequate channel widths. In a letter dated March 20, 1989 the pilots provided the following information:

"The channel narrows from 400' to 300' at the East end of the Inner Reach immediately South of Beacon #3. Inbound with large deep ships "smelling the bottom" we have to allow for a severe shear to the North at this point. The situation can be critical especially when we have to use a little extra speed to overcome the effects of high winds.

"On the South side of the Inner Reach between the East and Middle Turning Basins are Cruise Terminals #2, 3 and 4. On Mondays and Fridays all three are occupied. Beginning in March on Sundays and Thursdays #2 and 3 will be occupied. Seven days a week #2 is occupied by the day cruise, Sea Escape.

"...(T)he situation becomes critical when we are forced to use speed in order to maintain control during periods of high winds while these berths are occupied. We have had several instances of heavy surging and some damage to companion ways, parted mooring hawsers, etc."

In a letter dated October 10, 1989 the pilots detailed one incident which occurred within the 300-foot wide inner channel reach:

One of the pilots, "inbound with the tanker Pecos on the morning of May 11, 1987 and abeam Cruise Terminal 3, lost control when the Pecos took a "dive" to the south, caused by the uneven volume of water on each side. In other words, bank cushion effect. I am sure that we all understand the effect of suction and shear in narrow channels.

"...Had the Pecos incident occurred thirty seconds sooner, she would have rammed the Sea Escape passenger ship berthed at Cruise Terminal 2. Thirty seconds later, a collision with the east end of Commercial Wharf would have resulted in disaster, pollution, possible loss of life, fire, etc."

PLANNING OBJECTIVES AND CONSTRAINTS

Planning under Principles and Guidelines follows certain criteria required in the conduct of a study. Technical criteria require that plan selection be consistent with local planning for land use and area development. Design of navigation improvements must be feasible to construct, enable safe movement of vessels, and adequately serve existing and prospective commerce and traffic. Economic criteria require that the total of tangible national economic development (NED) benefits must exceed project costs on an equivalent annual basis for a justified plan. Each separable navigation feature must be incrementally justified, yielding benefits greater than or equal to its cost. Costs and benefits are compared on an average annual equivalent basis over a 50-year period of analysis using a mandatory interest rate established each year. The plan which maximizes net benefits (i.e. gives the greatest increment of benefits over and above costs) becomes the NED plan. Environmental quality criteria recognize the human and natural manifestations requiring subjective as well as objective analyses to consider esthetic, ecological and cultural contributions of the alternative plans.

The study process requires coordination and evaluation of information from multiple sources. Coordination and exchanges of information with those sources must be open and free from constraints. Competition and secrecy within various industry elements can complicate the data gathering process.

The Federal objective in water and related land resources planning is to recommend projects which provide the maximum contribution to national economic development consistent with protecting the Nation's environment. Consistent with that goal, the following objectives were established for the Canaveral Harbor navigation study for improvements:

a. Determine existing and prospective tonnage on deep-draft vessels and adequacy of the existing project to provide safe and economical operation of those vessels;

b. Determine the most economical excavation and disposal processes for navigation improvements;

c. Determine the effect of improvements on overall shipping costs of commodity movements;

d. Establish measures to minimize adverse effects on the environment and water quality during construction and maintenance of improvements;

e. Identify threatened and endangered species that frequent or inhabit the project area and establish means of protecting them from adverse project-related impacts;

f. Identify any historic or archaeological resources which may be disturbed by navigation improvements;

g. Preserve or enhance esthetic attributes which may be affected by navigation improvements; and

h. Determine whether recreational development at Lock Park and at the south jetty (fishing walkway) is practicable and economically justified.

ALTERNATIVE IMPROVEMENT FEATURES

Various improvement features address the problems and opportunities of navigation and recreation. The following paragraphs present an array of improvements and summarizes which ones are retained for detailed analyses. To better compare that array, the following reiterates the existing project description.

The existing civil works project provides for a 37' X 400' outer entrance channel, a 36' X 300' inner entrance channel, a 35' main turning basin, and a 31' West Turning Basin and Access Channel. Local interest completed the West Access Channel and Turning Basin deepening from 31 to 35 feet in May 1987. The U.S. Navy also provides a 44-foot deep over a 400-foot bottom width in the

Outer Entrance Channel and a 41-foot side channel and basin to service its facilities near the jettied entrance to the harbor. In accordance with Federal policy, Public Law 90-483, that portion of the Navy project which coexists with the Civil Works project is operated and maintained with Civil Works funds. This means that the Outer Entrance Channel, landward or west of the 37-foot contour, is operated and maintained as a Civil Works project. East of the 37-foot contour the U.S. Navy operates and maintains the entrance channel as well as the 41-foot trident channel and basin.

NAVIGATION

The Canaveral Port Authority desires a deeper harbor to enable large ships, calling at Canaveral, to load deeper with more cargo and a widener Inner Entrance Channel for safer and improved vessel movement. Based on discussions with the Port Authority and harbor pilots, a number of items of improvement became apparent as discussed below and displayed on plate 2 or 3.

Project Deepening.

As stated above, additional project depth is desirable to more efficiently load modern ocean going deep draft vessels. Project deepening will provide access for deeper-draft ships from the Atlantic Ocean to local berthing areas. To enable those ships to reach the berths, design conditions must allow additional depths to account for future harbor maintenance and ocean waves.

The deepening item of improvement consists of: extending the Civil Works channel beyond the 37-foot contour along the Navy's 44-foot Outer Entrance Channel alignment, deepening the Inner Entrance Channel, deepening a portion of the Middle Basin, and deepening the first 1,800 feet of the West Access Channel. Modification of depths in those areas must have a similar relationship to adequately service existing deep draft facilities. It should be noted that even though the U.S. Navy has a deeper depths than the Civil Works project in the Outer Entrance Channel, extra maintenance costs must be analysed for extending the Civil Works depth to a new offshore contour should the Navy leave the area. Further considerations involved an incremental shoaling determination on the new Civil Works depths up to 41 feet.

Civil Works Entrance Channel Deepening. Incremental extensions of the Civil Works Outer Entrance Channel were evaluated in relation to a 2-foot change in depth from the currently authorized depth of 37 feet (35-foot project depth with 2-foot wave allowance) to the existing Navy project depth of 44 feet. Deepening of the Inner Entrance Channel was also a consideration in 2-foot increments from the existing depth of 36 feet (35-foot project depth with 1-foot wave allowance) at the middle turning basin to the Outer Entrance Channel. Deepening the inner channel would allow tankers to call at greater loaded drafts than the existing channel depth permits, reducing light-loading for those vessels. This item of improvement was carried forward into the development of detailed plans.

Middle Turning Basin Deepening. Incremental deepening of a portion of the middle turning basin from the currently authorized 35 feet was considered in 2-foot increments (i.e. turning basin depths of 37, 39 or 41 feet). Deepening the turning basin would complement channel deepening plans, since the middle turning basin is used by the vessels which would benefit from greater channel depths. Only that portion of the turning basin that would be used by traffic utilizing project depths greater than 35 feet was considered as needing deepening. The remaining basin outside the deepened area provides mainly for military access to existing terminals on the north side. This item of improvement was carried forward into the development of detailed plans.

West Basin Access Channel Deepening. From the middle turning basin to the west turning basin incremental deepening of the channel was considered from the currently authorized 31-foot depth to 41 feet in two-foot increments. Although consideration initially was for the entire length, a reduction in scope was apparent during the evaluation of benefits. The benefits ended with with the westerly most commercial wharve existing along the north bank, a distance of about 1,800 feet. This improvement would allow vessels calling at those wharves to load to deeper drafts than are permitted by existing channel depths. This item of improvement was carried forward into the development of detailed plans.

Inner Channel Widening.

The local sponsor wanted widening of Inner Entrance Channel bottom from the Trident basin to the middle turning basin from the currently authorized 300 feet to 400 feet. Two alternative channel widening alignments were developed and carried forward to detailed plans. The first option would largely preserve the existing centerline of the channel by widening the channel bottom to the north and to the south of the existing channel. The second option would shift the channel centerline 50 feet to the north where all excavation associated with the widening would be done to the north of the existing channel. Additional widening schemes were considered. Inner Channel widening was retained for detailed analyses.

Assumption of Maintenance of 35-Foot West Channel & Basin.

Assuming maintenance of 35-foot depths provided by the port authority in the channel from the middle turning basin to the west turning basin and in the west turning basin was considered. This improvement would allow cruise vessels with drafts greater than 29 feet to use the new berths under construction in the west turning basin. This item of improvement was not carried forward into the development of detailed plans. That was because current and projected commercial multi-use of the basin and channel west of the cement bulk facilities would not benefit from the deeper channel depths at this time. Should future conditions change, the consideration of Federal maintenance of depths greater than 31 feet could be reevaluated.

West Basin Access Channel Bend Widener.

Canaveral Port Authority requested consideration of providing a bend widener along the south bank of the channel to ease the turn into the west turning basin. The turn into the west basin is was designed with a turning radius of 1,200 feet to accommodate vessels up to 800 feet long. Information provided by the cruise ship line which will use Cruise Terminal #5, located adjacent to the west basin, indicates their ships are less than 800 feet long. Since those cruise ships are the largest vessels using the west basin, a need for the bend widener could not be demonstrated and this item was dropped from further consideration.

RECREATION

The Canaveral Port Authority also desires, in addition to the improvements for navigation detailed above, consideration of two potential sites for recreational development, Lock Park and the south jetty. Those items are addressed in the following paragraphs.

Lock Park.

The Lock Park improvement plan would provide picnic shelters, a play structure, an open play area, a small dock for fishing, a lock observation tower, a short boardwalk to a dock on an inner lagoon, restrooms and a parking lot. The area would be fenced to separate recreation facilities from lock operations and would have a separate entrance for the public. This item was carried forward into the development of detailed plans.

Jetty Park Fishing Walkway.

The Jetty Park fishing walkway plan of improvement would modify approximately 1,600 feet of the south jetty to include paving, a fish cleaning station, guardrail with recessed lighting, and an entrance deck interconnecting the walkway with existing recreation facilities. This item was carried forward into the development of detailed plans.

ANALYSIS CRITERIA

In order to analyze the prospective conditions associated with the implementation of alternative plans for improving navigation and recreation, their economic, social, and environmental effects must be assessed and evaluated. The environmental and social consequences of navigation and recreation improvements are addressed in the accompanying Environmental Impact Statement (EIS). The ecomomic effects are evaluated in the immediate report sections that follow.

The Federal objective in water and related land resources planning is to recommend projects which provide the maximum contribution to national economic development consistent with protecting the Nation's environment. As stated earlier, those economic criteria require that the total of tangible national economic development (NED) benefits must exceed project costs on an equivalent annual basis in order for a plan to be economically justified. Each separable navigation feature must also be incrementally justified, yielding benefits greater than or equal to its cost. Costs and benefits are compared on an average annual equivalent basis over a 50-year period of analysis using the mandatory project evaluation interest rate which is established each year. The plan which maximizes net benefits (i.e. produces the greatest increment of benefits over and above costs) is designated as the NED plan.

The following sections of this report present an overview of the navigation and recreation benefits, a comparison of plan costs versus those benefits, and the selection of the plan with the largest amount of excess benefits over costs.

ALTERNATIVE NAVIGATION PLAN DESCRIPTIONS

The navigation items of improvement retained for detailed analyses essentially consist of deepening plans except for the location of the centerline of the Inner Channel widening. The improvement features were grouped together into two alternative sets of plans for economic and environmental evaluation. The reason for the two sets is to provide the local sponsor with a detailed analysis of Inner Channel widening. The local sponsor requested that the Inner Channel be relocated 100 feet to the north of the current alignment at a 400-foot bottom width.

The different sets of proposed project depths are a consideration on both Plan A and Plan B in this report. Plan A generally consists of deepening Canaveral Harbor in 2-foot increments with a 400-foot wide Inner Channel symmetrically widened about the existing channal centerline except for a 1,000-foot section prior to entering the middle basin. Plan B consists of deepening Canaveral Harbor in 2-foot increments over a 400-foot wide Inner Channel with its centerline located 50 feet to the north of the existing one. Plan B requires more excavation than Plan A because extra widening to the north will be in shallower water and impact more existing upland area.

Both plans call for extending the Civil Works Entrance Channel, deepening the inner channel and widening that reach to 400 feet, deepening the middle turning basin, and deepening the eastern most 1,800 feet of the west access channel. Material dredged during construction would be disposed of in a proposed Ocean Disposal Site, located approximately nine miles offshore. At the time of project construction (1993 assuming Section 201, Public Law 89-298, authorization), expectations are that the U.S. Navy will still be using the 44 feet in the Outer Entrance Channel. Both plans also include the Lock Park and south Jetty Park recreational developments. Those improvements are analyzed separately since they will be constructed on project lands not affected by these navigation improvements.

Plan A

This plan consists of increasing the authorized depth of the Outer Entrance Channel, the Inner Entrance Channel, middle turning basin, and the easternmost 1,800 feet of the west access channel. The plan also includes widening most of the Inner Entrance Channel by 50 feet to the north and south for a total bottom width of 400 feet. A 1,000-foot transitional section before entering the middle basin enables a 50-foot shift in the centerline of the 400-foot width to avoid existing piers. Alternative depths considerations ranged from 37 to 41 feet with an additional 1-foot of depth in the Inner Entrance Channel and 2 feet in the Outer Entrance Channel for wave action. An advanced maintenance overdepth of one foot on the existing project will be retained to lower future operation and maintenance costs. Excavation estimates range from 760,000 to 1,730,000 cubic yards. The unclassified material consists mostly of silts and clays with some sand. During construction one foot of allowable overdepth is permitted for dredging inaccuracies in obtaining the required depth. Plan A would enable future vessels to call at Canaveral Harbor with more economical drafts. Widening the inner channel would improve vessel handling and safety.

Plan B

This plan consists of the same major improvement elements and depth considerations as Plan A except the 300-foot bottom width is widened 100 feet from the north side of the channel. This shifts the existing centerline of the Inner Entrance Channel 50 feet northward of its location in plan A. The added depths for wave action and advance maintenance are identical to ones described in Plan A. Excavation estimates range from 1,380,000 to 2,320,000 cubic yards. This plan enables the same transportation savings as plan A but involves more dredging with associated environmental impacts.

NO-ACTION ALTERNATIVE

This plan provides for no improvements of Canaveral Harbor's waterways or turning basins. This alternative would not satisfy the objective of improving National Economic Development nor would it improve vessel handling and related safety problems.

NAVIGATION BENEFITS

Canaveral Harbor has experienced strong growth in cargo tonnage over the past 20 years. That growth has led to increases in both the number and size of vessels calling at Canaveral. The larger vessels currently calling at Canaveral are unable to load fully, due to existing channel conditions. Channel improvements would allow those vessels to load more fully, providing savings in the form of reduced transportation costs. Economic benefits for channel improvements were based solely on transportation cost savings. The following paragraphs discuss the derivation of transportation cost savings associated with channel improvements. The following sections provide a general overview of project related benefits. Detailed information on project benefits can be found in the Navigation Benefits appendix.

Major Commodities.

The Corps of Engineers publication Waterborne Commerce of the United States provides annual summaries of foreign, domestic and local tonnage movements by commodity class for harbors and waterways in the United States. Four major commodities groups, some of which include more than one commodity class, were found to comprise 84 percent of total deep draft tonnage at Canaveral Harbor in 1987. The major commodity groups and their component commodity classes are shown below. Benefits were calculated for each those four major commodities.

TABLE 12

COMMODITY GROUPS AND THEIR COMPONENT COMMODITY CLASSES
CANAVERAL HARBOR, FLORIDA
1987

COMMODITY GROUP	PERCENT OF TONNAGE	COMMODITY CLASSES
1. Gasoline	17.7	1711 Gasoline, including natural gasoline
2. Fuel Oil	27.9	2914 Distillate fuel oil 2915 Residual fuel oil
3. Building Cement	29.6	3241 Building cement
4. Scrap Metal	8.6	4011 Iron and steel scrap

Source: Waterborne Commerce of the United States, U.S. Army Corps of Engineers.

Draft Restriction.

The maximum draft of vessels calling at Canaveral Harbor under the without project condition (the existing harbor) was determined from discussions with the pilots and examination of historical records. The pilots will allow drafts of 34.5 feet under ideal conditions and using maximum tidal advantage. Otherwise, the draft is limited to 33.5 feet. An examination of historical records, maintained by both the pilots and the Corps of Engineers (Waterborne Commerce of the United States), showed an extremely small number of trips at drafts greater than 33 feet (only 27 out of more than a thousand trips in 1988). For this reason, the maximum draft under without project conditions was established as 33 feet (recognizing that occasional trips at greater drafts will occur under favorable conditions of weather and tide).

Vessel loading patterns.

Vessel loading patterns, origins, and destinations were determined for each of the four major commodities. Data from sources including pilots records, Waterborne Commerce, and interviews with shippers were used in that determination. Without the project loading patterns along with tonnage and fleet projections provided the basis for estimating transportation costs. With project improvements those patterns changed resulting in different transportation costs computed in a similar manner. Details of specific loading patterns by commodity are presented in the Navigation Benefits Appendix.

Voyage Costs.

Voyage costs were calculated for the relevant origins and destinations on each of the major commodity groups. Voyage costs and loading patterns (i.e. shipment size) provided the basis for calculating transportation costs per ton, for both without and with project conditions. Vessel operating costs came from the Economic Guidance Memorandum #90-3: Fiscal Year Deep Draft Vessel Cost Estimates.

Commodity Analysis.

Gasoline. The historical record for Canaveral Harbor gasoline receipts, shown in table 13, exhibits three distinct trends for different periods. The first period, from 1968 to 1974, had relatively stable levels of gasoline tonnage. The second period, from 1975 to 1980, saw gasoline receipts virtually cease at Canaveral. The third period from 1981 to the present is characterized by sustained growth in gasoline tonnage.

The recent increases in gasoline tonnages can be attributed to the operations of a single firm, Coastal Fuels Marketing, Inc. Gasoline shipped through Canaveral is distributed to the eastern most portion of the fast-growing Orlando area, as well as in the Melbourne-Titusville area. About one-third of the gasoline originates at refineries in the U.S. Gulf coast region and is loaded aboard ships in New Orleans. The remaining two-thirds originates at foreign refineries. In the past, foreign origins have included Brazil, Venezuela, an Aruba. Coastal Corporation, the corporate parent of Coastal Fuels Marketing, recently purchased a large refinery in Aruba. That facility is expected to be the primary point of origin for future gasoline imports to Canaveral.

Total waterborne shipments of gasoline to Florida have increased from about 8 million tons in 1968 to more than 15 million tons in 1987. Canaveral Harbor's share of the total has varied considerably over that period. Until 1983, Canaveral had never accounted for more than 1.3 percent of the total for the state. In recent years, the Canaveral Harbor share of the total has increased from 1.4 percent in 1983 to 2.4 percent in 1987, the latest year for which data are available.

TABLE 13

HISTORICAL GASOLINE RECEIPTS
CANAVERAL HARBOR
1968 - 1987

Year	Tons
1968	106,351
1969	101,083
1970	120,724
1971	114,139
1972	41,193
1973	117,639
1974	109,286
1975	13,987
1976	0
1977	0
1978	15,147
1979	0
1980	1,211
1981	50,602
1982	103,569
1983	184,976
1984	282,608
1985	243,554
1986	252,710
1987	366,204

Coastal Fuels expects the growth in Canaveral gasoline tonnage to continue at approximately 5% annually through the year 2000. The capacity of existing facilities is approximately 550,000 tons per year. Coastal Fuels has indicated that there is land available at the port for expansion of tank capacity as annual tonnage increases in the future.

Using the Energy Information Administration of the U.S. Department of Energy (DOE) projections for future energy needs and a trend analysis of harbor receipts of gasoline, the projected gasoline tonnages in table 14 were forecasted. The projection indicates that the capacity of the gasoline facilities at Canaveral will be reached sometime between 1993 and 2003. Implicit in the projection is construction of additional storage capacity to accommodate projected increases in tonnage after the year 2000. The most likely projection of future tonnage, shown below, provides the basis for calculating with and without project transportation costs and benefits.

TABLE 14

PROJECTED GASOLINE RECEIPTS
FOR MOST LIKELY FUTURE
1993 - 2043

YEAR	TONNAGE
1993	400,000
2003	650,000
2013	830,000
2023	830,000
2033	830,000
2043	830,000

Transportation cost savings associated increased channel depths were calculated for the projected gasoline fleets and the above tonnages. This was accomplished by analyzing the 1988 vessel loading pattern and tonnage per trip. Results of those analyses indicated that 94 percent of the gasoline tonnage would benefit from channel deepening.

The benefited gasoline tonnage was identified as all tonnage carried on trips which had the maximum allowable inbound draft (33 or 34 feet) and/or the minimum outbound draft (21 to 24 feet). Trips with minimum outbound drafts were included because of the two-port discharge without project. Those trips represent cases in which a substantial portion of the tonnage is unloaded at Port Everglades, with the remaining tonnage unloaded at Canaveral. With a project, the two-port discharge could be eliminated, thus allowing this tonnage to benefit from being shipped aboard a more-fully loaded vessel bound directly for Canaveral.

For those trips involving a two-port discharge without project, benefits were also calculated for the portion of cargo tonnage discharged at Port Everglades. Those benefits result from savings in the unit cost of transporting this tonnage on a fully laden vessel to Port Everglades and elimination of the voyage costs associated with multiple port calls and additional sailing time to Canaveral.

The calculation of total transportation cost savings for the benefited tonnage with project was conducted by dividing the voyage costs by the appropriate cargo tonnage to derive unit costs, i.e. transportation costs per ton. The difference in unit costs for different channel depths is the savings per ton associated with those depths. Those savings were applied to the benefited tonnage to calculate project benefits. Benefit calculations were performed for each class of vessel by 10-year increments for the required 50-year period of analysis. The savings by vessel class were then totaled and discounted to an average annual value using an interest rate of 8 7/8 percent. The results of those calculations are shown in table 15.

TABLE 15

GASOLINE - TRANSPORTATION COSTS AND SAVINGS WITHOUT PROJECT, 37', 39', AND 41' DEPTHS 1993-2043

(thousands of dollars)

Channel Depth	1993	2003	2013	2023	2033	2043	Total Average Annual	Average Annual Benefits
W/OUT	4,698	7,635	9,749	9,749	9,749	9,749	7,362	N/A
37 Feet	4,518	7,342	9,375	9,375	9,375	9,375	7,080	282
39 Feet	4,474	7,269	9,282	9,282	9,282	9,282	7,010	352
41 Feet	4,451	7,233	9,236	9,236	9,236	9,236	6,974	388

Fuel Oil. The historical record for Canaveral Harbor fuel oil receipts, shown in table 16, exhibits two distinct trends for different periods. The first period, from 1968 to 1975, was characterized by fast growth in the annual level of import tonnage. The second period, from 1976 to 1987, saw an erratic but distinct downward trend in the level of annual fuel oil import tonnage.

The decreases in fuel oil tonnages since 1976 can be attributed primarily to reductions in the use of fuel oil for electric power generation. Fuel oil shipped through Canaveral is used by two firms for electric power generation. Domestic fuel oil originates at refineries in the U.S. Gulf coast region and is loaded aboard ships in New Orleans. Foreign oil is also received at Canaveral from Aruba.

Three companies were identified as consumers of the fuel oil received at Canaveral. They are: (1) Orlando Utilities Company, an electrical power utility company; (2) Florida Power and Light, also an electrical utility; and Coastal Fuels, a distributor of petroleum based fuels including marine bunker oil, diesel oil, home heating oil and fuel oil for industrial use. These three firms account for virtually all of the fuel oil tonnage at Canaveral Harbor.

Orlando Utilities Company reported that their fuel oil is used to fuel three combustion turbines (CT's) at the Indian River power plant. The turbines were built in the mid 1960's and have just had major rehabilitation to extend their useful lives an additional 30 years. Orlando Utilities plans to keep the Indian River plant in service for more than 30 years from the present time, as the firm has no alternative for peak load management. The three turbines are used for peaking power, to provide flexibility in load management in a system which relies on coal and nuclear base load plants and has virtually no hydropower peaking capacity. The company has storage capacity for 325,000 barrels at the port.

TABLE 16

HISTORICAL FUEL OIL RECEIPTS
CANAVERAL HARBOR
1968 - 1987

YEAR	TONS
1968	445,504
1969	715,255
1970	832,658
1971	979,414
1972	1,054,765
1973	1,096,132
1974	1,485,795
1975	1,648,638
1976	1,367,186
1977	1,349,856
1978	1,206,543
1979	1,426,848
1980	941,059
1981	840,757
1982	854,999
1983	752,165
1984	614,802
1985	398,324
1986	518,659
1987	574,288

Source: Waterborne Commerce of the United States.

Florida Power and Light (FP&L) reported that their fuel oil is used to fuel the steam turbines at the Cape Canaveral power plant. The power plant was built around 20 years ago and FP&L intends to keep it in service for as long as possible with periodic maintenance and major rehabilitation. The plant will continue in service for the foreseeable future and will continue to be oil fired. The plant is also capable of burning gas, but only a limited amount of gas is available locally at Canaveral due to pipeline limitations. Available gas is insufficient to meet the plant's needs. The company has storage capacity for 268,000 barrels at the port.

Coastal Fuels reports that its fuel oil includes marine bunker oil, diesel fuel and oil for home heating and industrial use. Their fuel oil tonnage is expected to remain relatively stable, possibly growing at up to 3 percent annually. The company has recently increased diesel fuel storage at the port with construction of an additional 120,000 barrel tank.

The Energy Information Administration of the U.S. Department of Energy(DOE) projects future energy needs for the nation. The DOE's Annual Energy Outlook for 1989 includes projections of the consumption of energy by source and end use sector, and of petroleum supply and disposition balance. Those projections indicate that fuel oil consumption for electrical utilities is expected to increase by nearly seven percent annually from 1987 to 1993 and to increase at an annual rate of more than four percent from 1993 to 2000, the final year of the projection.

The growth scenario suggested by these projections agrees with the expectations of the electric utilities which receive fuel oil shipped through Canaveral Harbor. Both Orlando Utilities and Florida Power and Light Company cited expected annual tonnage growth rates of approximately five percent, which are very close to the national level projection. For these reasons, the national level projections were used as the basis for projecting future fuel oil tonnage for electrical utilities at Canaveral.

The DOE's Annual Energy Outlook for 1989 also includes projections for fuel oil consumption by the industrial and transportation sectors (non-Utility). Those projections indicate that fuel oil consumption for those sectors is expected to increase by nearly two percent annually from 1987 to 1993 and to increase at an annual rate of about one percent from 1993 to 2000, the final year of the projection.

The projections of utility and non-utility tonnage are shown in table 17. The total projected fuel oil receipts for Canaveral are also shown as the sum of utility and non-utility tonnage.

TABLE 17

PROJECTED FUEL OIL RECEIPTS
CANAVERAL HARBOR
1993 - 2043

	Utility	Non-Utility	Total
1993	644,000	157,000	801,000
2003	875,000	168,000	1,043,000
2013	875,000	168,000	1,043,000
2023	875,000	168,000	1,043,000
2033	875,000	168,000	1,043,000
2043	875,000	168,000	1,043,000

Under without project conditions, loaded drafts are limited to no more than 33 feet. A deeper channel would permit deeper loaded drafts. Deeper loaded drafts are the result of shipping more tonnage on a given vessel (increasing the average shipment size). For each vessel size class, the number of vessels needed to transport a given quantity of tonnage was determined based on average shipment size.

The potential increases in shipment size were confirmed by the three firms which receive fuel oil shipments at Canaveral Harbor. All three indicated that they would increase shipment sizes if the channel were deepened. The projected future tonnage, along with increases in shipment size, were used as the basis for calculating the transportation cost savings associated with increased channel depths. The resulting transportation cost totals were summed for each 10-year period from 1993 to 2043 and discounted to an average annual value using the current Federal project evaluation interest rate of 8 7/8 percent. The average annual transportation cost with a deeper channel was subtracted from the average annual transportation cost without project to provide an estimate of average annual benefits to fuel oil. The results of those calculations, along with those for the without project and 37-foot depth are displayed in table 18.

TABLE 18

FUEL OIL - TRANSPORTATION COSTS AND SAVINGS
WITHOUT PROJECT, 37', 39', AND 41' DEPTHS
1993-2043

(thousands of dollars)

Channel Depth	1993	2003	2013	2023	2033	2043	Total Average Annual	Average Annual Benefits
W/OUT	5,429.4	7,469.9	7,469.9	7,469.9	7,469.9	7,469.9	6,854.2	N/A
37'	5,182.9	7,045.7	7,045.7	7,045.7	7,045.7	7,045.7	6,483.6	370.6
39'	5,058.0	6,753.4	6,753.4	6,753.4	6,753.4	6,753.4	6,241.9	612.4
41'	4,907.5	6,613.8	6,613.8	6,613.8	6,613.8	6,613.8	6,099.0	755.3

Building Cement. Cement imports have traditionally been a relatively low proportion of total cement consumption in the U.S. In the last several years, beginning in 1984, the proportion of total cement imports relative to consumption in the U.S. has increased substantially. The increase in U.S. cement imports (shown in table 32, along with imports to the Miami and Tampa Customs Districts and Canaveral Harbor) has been characterized by an influx of cement from Mexico. Imports of cement from Mexico have increased by approximately 500 percent since 1983. Imports from Spain have increased by almost 300 percent during the same period.

TABLE 19

BUILDING CEMENT - HISTORICAL IMPORTS
U.S., MIAMI AND TAMPA CUSTOMS DISTRICTS AND CANAVERAL

	U.S. Total	Miami/Tampa Customs Districts Imports	Canaveral Harbor Imports
1975	3,702,000	851,000	88,200
1976	3,107,000	641,000	251,500
1977	4,016,000	656,000	170,000
1978	6,597,000	874,000	762,600
1979	9,413,000	1,390,000	391,500
1980	5,263,000	1,278,000	408,800
1981	3,997,000	1,030,000	517,000
1982	2,929,000	709,000	363,000
1983	4,268,000	905,000	226,900
1984	8,846,000	2,267,000	780,000
1985	14,487,000	3,212,000	796,700
1986	16,319,000	3,742,000	808,000
1987	17,726,000	3,636,000	610,500

Over 50 percent of the cement consumed in Florida is imported through the State's two customs districts, Miami and Tampa. Before 1984 cement imports into Florida were usually less than 1.0 million tons per year. Florida cement imports have increased by approximately 300 percent since 1983. The bulk of the increase in cement imports is accounted for by tonnage from Mexico. The nations of Mexico, Spain and Venezuela collectively account for almost three-quarters of imported cement in Florida.

Cement imports increased by about 200 percent between 1983 and 1987 in the Miami district, compared to a 400 percent increase through the Tampa district. While tonnages through Canaveral Harbor have increased (disregarding an apparent discrepancy in the reported tonnage for 1978) the Port's overall market share has declined. The data indicate that cement tonnages imported through Canaveral Harbor have constituted as much as three-quarters of the Tampa customs district in the early 1980's. In spite of increased cement imports through Canaveral Harbor until 1987, the Port's share of Tampa customs district total cement imports declined to approximately one-third in 1986.

Future cement imports were projected based on 1985 OBERS projected growth rates for construction earnings in the combined Melbourne, Titusville, Palm Bay, and Orlando EA's applied to current tonnage. The growth rates were derived from the 1985 OBERS BEA Regional Projections. The final step in determining the benefited tonnage was to project future cement imports and to identify the proportion of total tonnage attributable to each country of origin. The proportions of 1988 imports by country of origin were applied to the projection of total cement imports to calculate the projected tonnage by country of origin shown in table 20.

TABLE 20

PROJECTED IMPORTS OF CEMENT
BY PORT OF ORIGIN
1993 - 2043

	1993	2003	2013	2023	2033	2043
Tampico, Mexico	271,500	338,700	389,100	434,500	488,300	543,000
Vera Cruz, Mexico	82,800	103,300	118,600	132,500	148,900	165,600
Cartagena, Colombia	324,000	404,200	464,400	518,500	582,800	648,100
Pertigalete, Venezuela	150,400	187,600	215,600	240,700	270,600	300,900
Other	61,400	76,600	88,000	98,300	110,500	122,800
TOTAL	890,100	1,110,400	1,275,700	1,424,500	1,601,100	1,780,400

The with project building cement fleet reflects greater loaded drafts for the larger vessels. With a deeper channel, shipment sizes would increase and fewer trips would be required to transport a given quantity of cement. Building cement benefits were calculated by a method similar to that used for gasoline and fuel oil benefits. Without project loading patterns were determined based on the 1988 fleet and tonnage. Unit costs were calculated for the several size classes of vessels which would benefit from a deeper channel from each of three origins (Colombia, Venezuela and the Mediterranean).

The with project transportation costs were calculated by the same method as the without project transportation costs. The results of those calculations, along with those for the without project condition are displayed in table 21.

TABLE 21

BUILDING CEMENT TRANSPORTATION COSTS AND SAVINGS
WITHOUT PROJECT, 37′, 39′ AND 41′ DEPTHS
1993-2043
(thousands of dollars)

	1993	2003	2013	2023	2033	2043	Total Average Annual	Average Annual Benefits
W/Out	3,383.0	4,218.7	4,673.8	5,074.2	5,612.9	6,019.8	4,170.9	N/A
37′	3,253.4	4,096.9	4,542.1	4,929.2	5,458.6	5,858.0	4,042.0	128.8
39′	3,197.5	3,985.8	4,416.1	4,781.0	5,291.8	5,684.4	3,939.7	231.2
41′	3,191,5	3,979.8	4,371.6	4,728.0	5,201.5	5,576.5	3,419.8	251.0

Scrap Metal. Exports of shredded scrap from Canaveral Harbor have risen dramatically since shipments were first made in 1974. Shredded scrap is used to manufacture steel. World steel production has been growing slowly during the time that shredded scrap has been exported from Canaveral. The major trends in steel production are a decline in output by industrialized nations, such as the U.S. and Japan, and a rapid increase in production by industrializing nations, such as Korea and Turkey.

Table 22 shows total scrap exports and shredded scrap exports for the U.S.and shredded scrap exports for Canaveral for 1970 to 1987. Total U.S.scrap exports and shredded scrap exports have fluctuated with recurring high and low values, indicating a cyclical market steel and corresponding cyclical demand for export scrap. Canaveral Harbor scrap exports indicate fluctuations also, peaking at 131,100 tons in 1978 and again in 1984, 1986 and 1987. Overall, U.S. scrap exports have increased, however, the cyclical nature of exports distorts average annual demand trends. U.S. shredded scrap exports had average annual compound growth rates of 8.84 percent and 9.50 percent in two cycles spanning 1974 to 1980 and 1981 to 1987, respectively. The average annual growth rate for the entire period from 1974 to 1987 was about 4 percent. U.S. shredded scrap exports have been relatively volatile in the two cyclical periods from 1974 to 1987. The average annual compound growth rate for U.S. shredded scrap exports from 1975 to 1987 was about 3 percent. The rate of growth for Canaveral Harbor exports for the same period was 9.2 percent.

TABLE 22

U.S. AND CANAVERAL SCRAP EXPORTS
1970 - 1987

	Total Scrap (U.S.)	Shredded Scrap (U.S.)	Shredded Scrap (Canaveral)
1970	10,111,000	1,165,000	0
1971	6,082,000	1,026,000	0
1972	7,177,000	1,463,000	0
1973	10,874,000	2,098,000	0
1974	8,497,000	1,999,000	9,700
1975	9,442,000	2,409,000	61,600
1976	7,877,000	2,179,000	70,900
1977	5,854,000	1,606,000	45,600
1978	9,039,000	2,684,000	131,100
1979	11,054,000	2,980,000	84,000
1980	11,168,000	3,323,000	70,400
1981	6,415,000	1,923,000	86,600
1982	6,804,000	2,023,000	98,000
1983	7,520,000	2,029,000	53,400
1984	9,498,000	2,775,000	136,200
1985	9,950,000	2,559,000	101,600
1986	11,704,000	3,495,000	155,600
1987	10,637,000	3.314,000	177,100

U.S. scrap exports to industrializing nations, such as Korea and Turkey, have increased by 100 and 200 percent, respectively, since 1983. Traditional scrap markets, such as Japan, have declined while exports to non-industrial nations have not. Japanese scrap imports have been relatively stagnant since the early 1970's; however, Korean and Turkish scrap imports have increased greatly. U.S. exports represent less than 10 percent of total scrap consumption in Japan. In Korea and Turkey, U.S. scrap exports make up more than 50 percent of consumption. Clearly, Korea and Turkey constitute major markets for U.S. scrap.

The Canaveral Port Authority indicated that the major scrap export markets were as follows, in order of importance: (1) Korea; (2) Turkey; (3) Yugoslavia; (4) Greece; and (5) Spain. While there are multiple shippers of record, there is only one supplier of scrap, Yorke Doliner & Company.

The cyclical nature of scrap exports from Canaveral is evident. Scrap exports from Canaveral have increased at phenomenal rate of growth during the most recent cycle, particularly from 1984 to 1988. Exports in the range of 200,000 tons a year are approaching the 250,000 ton annual capacity of the scrap facilities at Canaveral. Exports in the 200,000 ton range also coincide with strong U.S. export markets because of high levels of foreign demand and favorable currency exchange rates.

The most likely projection reflects a future in which scrap exports continue to enjoy a moderate overall rate of growth and the level of scrap exports over time reflects the average of the business cycle. That set of projections incorporates the upper limit of the scrap generating capacity of Yorke Doliner & company, 250,000 tons annually, as the constraint on future exports. Under the most likely business scenario the capacity constraint is not achieved until 2003. The resulting projection is shown in table 23.

TABLE 23

PROJECTED SCRAP EXPORTS
BY COUNTRY OF DESTINATION
1990 - 2043

	1993	2003	2013	2023	2033	2043
Korea	91,400	119,200	125,000	125,000	125,000	125,000
Turkey	91,400	119,200	125,000	125,000	125,000	125,000

The with project scrap metal fleet reflects greater loaded drafts for the larger vessels. The Yorke Doliner & Company, which exports scrap metal, has indicated that they would like to be able to increase the size of shipments from Canaveral, but are unable to do so because of the existing channel depth. The larger vessels now used for exporting scrap leave Canaveral light loaded. With a deeper channel, shipment sizes would increase and fewer trips would be required to transport a given quantity of scrap metal.

Scrap metal benefits were calculated by a method similar to that used for building cement benefits. Without project loading patterns were determined based on the 1988 fleet and tonnage. Unit costs were calculated for the several size classes of vessels which would benefit from a deeper channel from each of two destinations (Korea and Turkey). Without project voyage costs were calculated for a direct trip from Canaveral to the port of destination.

The without project transportation costs were calculated from the unit costs, average tons per vessel and number of vessels by size class. The with project transportation costs were calculated by the same method as the without project transportation costs. The results of those calculations, along with those for the without project depth are displayed in table 24.

TABLE 24

SCRAP METAL TRANSPORTATION COSTS AND SAVINGS
WITHOUT PROJECT, 37', 39' AND 41' DEPTHS
1993-2043

(thousands of dollars)

	1993	2003	2013	2023	2033	2043	Total Average Annual	Average Annual Benefits
W/Out	1,671.0	2,525.3	2,525.3	2,525.3	2,525.3	2,525.3	2,267.5	N/A
37'	1,536.3	2,322.3	2,322.3	2,322.3	2,322.3	2,322.3	2,032.0	182.4
39'	1,416.9	2,209.9	2,209.9	2,209.9	2,209.9	2,209.9	1,984.2	283.3
41'	1,435.7	2,169.9	2,169.9	2,169.9	2,169.9	2,169.9	1,810.0	319.1

Total Navigation Benefits.

The transportation cost reduction benefits for the four major commodities, gasoline, fuel oil, building cement, and scrap metal were summed to provide estimate of total navigation benefits for the proposed channel improvements. The benefit totals are shown in table 25.

TABLE 25

TOTAL TRANSPORTATION COST REDUCTION BENEFITS
37', 39', AND 41' DEPTHS
1993-2043

(thousands of dollars)

	37-FOOT PROJECT	39-FOOT PROJECT	41-FOOT PROJECT
Gasoline	282.3	352.3	387.6
Fuel Oil	370.6	612.4	755.3
Building Cement	128.8	231.2	251.0
Scrap Metal	182.4	283.3	319.1
TOTAL	964.1	1,479.2	1,713.0

ALTERNATIVE NAVIGATION PLAN COMPARISON

The formulation and evaluation process produced two final alternative sets of plans which address the navigation problems of the study area. The considered depths were 37, 39, and 41 feet and the resulting economics are presented in table 26. The plan which has the largest amount of net benefits is the plan that maximizes the net return to the National Economic development (NED) account. As shown in table 26, that plan is Plan A with a project depth of 39 feet.

Disposal alternatives were the same for each plan. The nature of the material (mostly silt and clay) from channel enlargement precludes its use as suitable beach fill or as suitable land fill at the port because of its poor bearing characteristics. The port has no available area in the civilian sector for permanent disposal of unsuitable material. The cost of temporarily storing 1 million cubic yards of excavated material in that sector and then trucking it 14 to 15 miles inland to alternate disposal sites is prohibitive. The disposal area on government lands, owned by the military in the northeast quadrant of the port, has a priority use in support of military channel and berthing area maintenance. Based on existing conditions, there are no economically feasible areas for disposal of the material from the proposed dredging at the port. there are no other choices for disposal at Canaveral Harbor other than ocean disposal site to be designated by the Environmental Protection Agency (EPA).

TABLE 26

COMPARATIVE ECONOMICS - FINAL NAVIGATION PLANS
(In thousands of dollars, $000)

Item	PROJECT DEPTH IN FEET 37	39	41
FIRST COSTS			
Construction Costs			
PLAN A	$7,554	$10,498	$14,066
PLAN B	$11,289	$14,188	$17,241
Interest During Construction			
PLAN A	$159	$225	$461
PLAN B	$243	$465	$699
Total First Costs			
PLAN A	$7,713	$10,723	$14,527
PLAN B	$11,532	$14,653	$17,940
ANNUAL COSTS			
Interest & Amortization			
PLAN A	$694	$965	$1,308
PLAN B	$1,038	$1,319	$1,615
Incremental Operation & Maintenance			
PLAN A	$24	$26	$28
PLAN B	$24	$26	$28
Total Annual Costs			
PLAN A	$718	$991	$1,336
PLAN B	$1,062	$1,345	$1,643
ANNUAL BENEFITS			
PLAN A	$ 964	$1,479	$1,713
PLAN B	$ 964	$1,479	$1,713
NET BENEFITS			
PLAN A	$245	$488	$377
PLAN B	$(98)	$134	$ 70
BENEFIT/COST RATIO			
PLAN A	1.3	1.5	1.3
PLAN B	0.9	1.1	1.0

Plan A uses the existing centerline of the Inner Entrance Channel except for 1,000 feet prior to entering the middle turning basin. In that reach the centerline transitions 50 feet to the north over a distance of 800 feet between station 207+00 and 215+00 to avoid an existing port pier and berth. The change in direction is less than 5 degrees. The port pilots know about the offset and have indicated it will be no problem with the wider channel. The proposed channel on Plan A stays more in existing deep water and is more centrally located with respect to existing and proposed port development. Its 400-foot width is about 180 feet from the existing structures on the south side of the channel. On the north side the U.S. Air Force has plans for a proposed berth and pier to handle a ship 595 feet in length and 75 feet in beam. The proposed pier is about 170 feet from the bottom edge of the 400-foot channel. Plan A is a more equitable solution with the possibilities of facilities on both sides of the channel in the future.

Plan B shifts the entire channel centerline 50 feet to the north. With that shift the existing channel edge on the south side stays about 230 feet from existing piers but the north edge moves closer to the one proposed on the north side. With the existing channel being closer to shallower water on the north side, there is more excavation causing longer periods of turbidity at the various proposed depths.

A summary comparison of both Plans A and B indicate some similarities and differences. Both plans would use the ocean disposal site designated by EPA for dredged material. With channel widening some shallow water areas would be converted to deeper depths for navigation, but for the most part the channels and basins are in portions of the harbor that have been disturbed previously. Plan A at 37 feet would have the least impact on the environment of all the considered alternatives as it would involve the least amount of excavation and turbidity. However, there would be minimal differences in overall area of project excavated acreages between it and the NED plan. Manatees, sea turtles, and whales could encounter potential hazards during construction of all plans; however, protective measures are included in all the plans to minimize the likelihood of incidental occurrences.

ALTERNATIVE RECREATIONAL PLAN PROPOSALS

As with many harbor projects, available lands eligible for cost-shared development are limited. However, two sites on the Canaveral Harbor project meet all Federal criteria and present unique recreational opportunities integrally related to the project. The recreational plans consist of proposals for two sites: a park on the south side of the barge canal lock, on the far west end of the Canaveral Harbor project; and, a fishing walkway on the portion of the south jetty extending from the into the ocean at the harbor entrance. Those locations are shown on the maps contained in appendix A.

The site at the barge canal lock, known as Lock Park, currently consists of an open area without parking or other amenities, please see photo 1 in appendix A. However, the lock itself, constructed as part of the existing Canaveral Harbor project, has a high interest value and potentially offers an educational opportunity. Natural views from the site are of the river and of a salt-shrub plant community that attracts many birds, including the Great Heron and the endangered Wood Stork. The park also affords an unobstructed view of the Kennedy Space Center, which is considered a major national resource. The County maintains a small boat ramp with facilities about 0.3 miles directly east along the canal. Further east, there is a small recreational boat marina.

The ocean jetty site, known as Jetty Park, is located approximately two miles east of the Lock Park, at the harbor entrance on the Atlantic Ocean. It is a popular ocean beach park operated by the Brevard County Parks and Recreation Department. Current activities include R.V. and tent-camping, picnicking and swimming. The park provides parking, a small grocery store, snack bar, bait shop, laundry facilities, and restrooms. The south jetty is already popular as a local fishing spot, but the uneven jagged rocks are hazardous to anglers as shown in Photo 2 in appendix A. With the 500-foot extension of the extension of the south jetty, proposed for the Federal sand bypass system as another part of the Canaveral Harbor project, the attraction and danger to fishermen will be increased. Detailed location maps and descriptions of the recreation plans are contained in appendix A. A general overview is presented below.

RECREATIONAL DEMAND

Recreational demand was determined using both quantitative and qualitative assessments. The 1987 Florida Statewide Comprehensive Outdoor Recreation Plan (SCORP) identifies regional supply deficits in specific resource and facility units. When identified needs will be partially met by implementation of the recommended recreational plan, demand is assumed to exist. Since the SCORP's planning period, to 1995, is significantly shorter than the 50-year feasibility planning period to 2043, use of the SCORP assessment results in a conservative estimate for project planning. Therefore, this plan does not reflect recreation requirements attributed to an expected population growth of 45 percent as forecast by OBERS through 2043. A qualitative view of demand was obtained through discussions with the Brevard County Parks and Recreation personnel. Their projections of park use are based on observed patterns at existing facilities and through traffic count analyses.

Proposed activities at the Lock Park include picnicking, sightseeing, and bicycling. Of these activities, the Florida SCORP projects a deficit of 465 miles of bicycle trails in 1995 within region VI, which includes Brevard County. There is no projected deficit for picnic tables or for sightseeing opportunities. However, given the current (1989) full capacity condition of Brevard County recreation facilities, it is estimated by the County that the Lock Park will receive a minimum of 300 patrons per day given its size and programmed amenities. On days when there are shuttle launches, the Lock Park is expected to have considerably greater utilization.

The jetty fishing walkway primarily provides an opportunity for saltwater fishing (non-boat). Heavy demand for this activity throughout the region is documented in the 1987 SCORP. Within SCORP region VI, the 1985 demand for saltwater fishing (non-boat) exceeded supply, resulting in a deficit of facilities for up to 1,026 persons per weekend day, or 5,133 linear feet of fishing access. Projections to 1995 increase the deficit to 16,493 linear feet of fishing access. This six-county deficit in region VI can be met only in the two coastal counties of Volusia and Brevard.

The current rate of usage at Jetty Park has been documented by traffic count to be approximately 1,960 per day (August 1989). Of those, approximately 150 people are currently using the jetty for fishing regardless of the difficult access and the unsafe situation. The County Recreation Department estimates that, at minimum, double that number of people would use an easy accessible and safe fishing walkway. All recreational facilities in the county are currently well to overused by tourist demand. The County has acquired an additional 200' of beach front (15 acres) at Jetty Park which will be developed for public use by the time this proposed fishing walkway would be complete, further increasing the expected walkway use.

The Fernandina Beach State Park was used for comparison as it provides comparable major tourist/local recreation facilities, including a 1,500-foot lighted fishing pier at the entrance to the Cumberland Sound (St. Mary's River at the Florida/Georgia border). It has a documented usage rate of approximately 20,000 per month. It is estimated that between one-third and one-half of park users are actively using the fishing pier, or about 276 per day.

RECREATIONAL BENEFIT ESTIMATES

For the purposes of benefit estimation the capacity method was used to determine the annual recreational days that would be expected at the proposed Lock Park and jetty fishing walkway. These closely compared with use estimates provided by the County. At both sites, instantaneous capacity factors, daily turnover rates, and weekend versus weekday recreation patterns were used to determine the expected annual visitation. In this region of Florida there is no seasonability to recreational participation.

The estimated annual use of the Lock Park is 41,600 recreational days at the beginning of the planning period. Growth from this 66 percent capacity to full capacity or 62,400 recreational days, was assumed over the project's 50-year life.

The estimated annual use of the jetty fishing walkway was calculated as a combination of existing use (base condition) and increased use related to proposed walkway construction. At the beginning of the planning period, annual use was estimated at 62,400 recreation days, where half represents the marginal increase over the base condition. Growth to 86,800 recreational days, or full capacity, was assumed over the project's 50-year life.

A unit-day value was assigned to the recreational experience at the Lock Park and at the fishing walkway (with and without walkway installation). Those values were based on characteristics of the proposed facilities, competitive facilities within the market area, carrying capacity, and the potential recreational experience.

Average annual equivalent benefits for the Lock Park are estimated at $201,900 on the basis of a $4.35 unit-day value. Average annual equivalent benefits for the jetty fishing walkway are estimated at $237,800 on the basis of a $5.10 unit-day value for the with-project condition and a net differential of $1.60 from the base condition which is given a value of $3.50. Total combined average annual benefits for the proposed recreational plan were estimated at $439,700.

NON-STRUCTURAL PLAN

A review of the existing project at Canaveral Harbor indicated no potential areas of consideration for non-structural measures as a means of addressing problems and opportunities. Essentially the no-action plan which provides for no structural improvements is the non-structural plan or the without project condition as shown in table 27.

SUMMARY OF ECONOMIC, SOCIAL, AND ENVIRONMENTAL EFFECTS

In accordance with Section 122 of the River and Harbors and Flood Control Act of 1970, Public Law 91-611, a summary of the possible beneficial and adverse economic, social, and environmental effects are displayed in table 27. In that table, Plans A and B are compared to the existing and without project conditions.

FLOOD PLAIN ASSESSMENT

Executive Order 11988 requires the Federal Government to avoid , if possible, adverse impacts associated with the occupancy and modification of flood plains as well as direct or indirect support of development to those areas where there is a practical alternative. Most of the Port Canaveral lands, which border the Federal harbor project, are outside the 500-year flood plain with the remaining lands being outside the 100-year flood plain. As shown in the summary comparison (table 27), there are no floodplain or wetland impacts for dredging activities and consequently, no gains or losses of those type acreages in the floodplain or the coastal zone are realized. Therefore, the proposed plan is in compliance with the governing Executive Orders calling for the enumeration of those possible impacts.

PLAN SELECTION

The navigation alternatives included Plans A and B at various proposed depths with a 400-foot width in the inner channel as discussed previously. Plan A for navigation with a depth of 39 feet and inner channel width of 400 feet is the selected NED plan as it provides the maximum benefits over cost as shown in table 26. Plan A places the enlargement of the proposed inner channel in a more central location between existing and proposed port facilities to the north and south. That positioning takes the best advantage of existing deep water to minimize excavation quantities associated with deepening and widening. The port pilots, the sponsor, and the military components on the north side of the port are in agreement with the proposed plan selected as the navigation improvement for Canaveral Harbor. Coordination of that plan with the public indicated acceptance with no controversy.

TABLE 27

SUMMARY COMPARISON OF FINAL ALTERNATIVE PLANS

	Existing Condition	Without Condition	Plan A	Plan B
A. Plan Description	From field data, calculations, publications, and information furnished by other agencies and the public.	Most probable future without navigation improvements in the Canaveral Harbor area.	Provides for a 41' X 400' entrance channel; a 40' X 400' Inner Channel widened 50' on each side of existing channel limits; a 1,200' diameter by 39' deep Middle Turning Basin; and a 1,800' X 39'deep X 400' West Access Channel. Disposal of 1,232,000 cy of unclassified material within an offshore disposal site. Plan includes recreation facilities at the Lock Park and Jetty Park.	Same as Plan A except the Inner channel is widened 100' to north of existing channel limits. Disposal of 1,835,000 cy of unclassified material within offshore disposal site. Same recreation facilities as Plan A.
B. Significant Impacts				
1. National Economic Development Account				
a. Beneficial Effects				
Annual Transportation Cost Savings	$0	$0	$1,479,000	$1,479,000
Annual Recreation Benefits	$0	$0	$440,000	$440,000

TABLE 27 (Continued)

SUMMARY COMPARISON OF FINAL ALTERNATIVE PLANS

	Existing Condition	Without Condition	Plan A	Plan B
b. Adverse Effects 1) First Cost of project	00	00	$11,419,000	$15,109,000
2) Annual cost of project	00	00	$1,133,000	$1,487,000
c. Net Annual NED Benefits	00	00	$786,000	$432,000
d. Benefit-to Cost Ratio	00	00	1.7 to 1	1.3 to 1
a. Manmade Resources	Movement of existing tonnages by light-loading of vessels within the current fleet using the in-place harbor facilities.	Increases in tonnage shipped on vessels limited by depths within the Inner Channel and Middle Turning Basin.	Construction and maintenance of proposed improvements would allow for more efficient and increased usage of the harbor and port facilities by vessels on all trade routes.	Construction and maintenance of proposed improvements would allow for more efficient and increased usage of the harbor and port facilities by vessels on all trade routes.
b. Natural Resources	Temporary increases in turbidity during maintenance dredging would cause some increased stress to marine plants and animals.	Temporary increases in turbidity during maintenance dredging would cause some increased stress to marine plants and animals.	To be added.	To be added.

TABLE 27 (Continued)

SUMMARY COMPARISON OF FINAL ALTERNATIVE PLANS

	Existing Condition	Without Condition	Plan A	Plan B
c. Endangered Species	No impact.	Potential for increased hazards to manatees due to increased vessel traffic.	Potential for increased hazards to manatees, sea turtles, and whales during construction operations.	Same impact as plan A.
d. Air Quality	Continued usage of harbor would result in minor decrease in air quality due to ship and vehicular traffic emissions.	Increased usage of harbor would result in minor decrease in air quality due to ship vehicular traffic emissions. Slightly greater impact than existing condition.	Same impact as without project condition.	Same impact as without project condition.
e. Water Quality	Temporary decrease in water quality during maintenance dredging. Impacts include reduced light penetration, increase in suspended solids, and decrease in dissolved oxygen level.	Same impact as existing condition.	Temporary decrease in water quality during construction and maintenance dredging. Impacts include reduced light penetration, increase in suspended solids, and decrease in dissolved oxygen level. Possible adverse impact from offshore disposal of dredged material.	Temporary decrease in water quality during construction and maintenance dredging. Impacts include reduced light penetration, increase in suspended solids, and decrease in dissolved oxygen level. Possible adverse impact from offshore disposal of dredged material. Greater impact than plan A.

TABLE 27 (Continued)

SUMMARY COMPARISON OF FINAL ALTERNATIVE PLANS

	Existing Condition	Without Condition	Plan A	Plan B
f. Fish and Wildlife	Adverse water quality during maintenance dredging would temporarily disturb fish populations in and near the channel.	Same impact as existing condition.	Increased stress to marine organisms due to increased turbidity associated with construction and maintenance dredging.	Increased stress to marine organisms due to increased turbidity associated with construction and maintenance dredging.
g. Ecosystem	Continued disruption of bottom organisms within existing channel limits. Continued stress to marine organisms due to increased turbidity associated with maintenance dredging.	Same impact as existing condition.	Destruction of benthic organisms within the channel during construction and maintenance dredging operations.	Destruction of benthic organisms within the channel during construction and maintenance dredging operations. Greater impact than plan A.
h. Food Chains	Destruction of benthic organisms within the channel during maintenance dredging operations.	Same impact as existing condition.	Destruction of benthic organisms within the channel during construction and maintenance dredging operations.	Destruction of benthic organisms within the channel during construction and maintenance dredging operations. Greater impact than plan A.

TABLE 27 (Continued)

SUMMARY COMPARISON OF FINAL ALTERNATIVE PLANS

	Existing Condition	Without Condition	Plan A	Plan B
i. Archeological and historic sites	No known sites within the work area.	Same impact as existing condition.	Same impact as existing condition.	Same impact as existing condition.
3. Social Well-Being (Beneficial or Adverse Effects)				
a. Public Facilities and Services	Continued inefficient utilization of the existing port facilities.	Inefficient utilization of the proposed future port activities.	Reduction in transportation costs for commodities shipped through port. More efficient utilization of port facilities and improved vessel handling and safety.	Same impact as plan A.
b. Community growth	No impact. Growth consonant with that expected in south Florida.	Same impact as existing condition.	Improved port would help provide a more stable base for planned community growth.	Same impact as plan A.
c. Community Cohesion	No impact.	No impact.	Navigation improvements would encourage social and economic stability and cohesion.	Same impact as plan A.
d. Displacement of People	No impact.	No impact.	No impact.	No impact.

TABLE 27 (Continued)

SUMMARY COMPARISON OF FINAL ALTERNATIVE PLANS

	Existing Condition	Without Condition	Plan A	Plan B
e. Noise	Temporary minor increase expected during maintenance dredging of the existing project.	Temporary minor increase expected during maintenance dredging of the existing project and for transporting and handling greater volumes of cargo.	Temporary minor increase expected during construction and maintenance dredging and for transporting and handling greater volumes of cargo. Greater impact than existing or without conditions.	Same impact as plan A.
f. Esthetics	No impact.	Minor loss of esthetics due to construction of additional passenger terminals and port facilities, and increased shipping activity.	Same impact as without condition.	Same impact as without condition.
4. Regional Development				
a. Tax Revenue	No impact.	Minor increase due to rise in commerce, land values, and employment.	Slightly greater impact than without condition.	Same impact as plan A.
b. Employment/Labor Force	No impact.	Minor increase due to greater volumes of cargo handled through port.	Same impact as without condition.	Same impact as without condition.
c. Business and Industrial Activity	No impact.	Increase in activity due to increase in commerce.	Increase in activity due to increase in commerce and reduced transportation costs.	Same impact as plan A.

Plans A and B for navigation also included recreation as added features of those plans at the request of the Canaveral Port Authority. The alternatives for recreation included the development of a Lock Park and improvements to the existing Jetty Park. Both alternatives are feasible, as shown in table 28, and are selected for inclusion in the proposed plan of improvement.

The resulting Plan A, selected for improvements to Canaveral Harbor, involves both navigation and recreation. That plan is in accordance with the Congressional study authority cited at the beginning of this report. Each of those major plan objectives (navigation and recreation) has separable project elements which were incrementally justified on the basis of separable benefits and costs. The selected elements for navigation on the NED Plan were the 39-foot depth for deepening and 400 feet for widening. On the selected plan for recreation the two separable elements for economic consideration are (1) the Canaveral Harbor Lock Park recreational development and (2) the Jetty Fishing Walkway recreational development. Average annual equivalent benefits and costs for navigation and recreation are shown in table 28, demonstrating that each increment produces benefits greater than its costs.

TABLE 28

BENEFITS AND COSTS FOR SEPARABLE PROJECT INCREMENTS

Item	Navigation Features	Canaveral Harbor Lock Park	Jetty Fishing Walkway	**TOTAL PROJECT NED PLAN**
First Costs				
Project Cost	10,498,000	478,000	443,000	$11,419,000
Interest During Construction (IDC)	225,000	10,000	18,000	253,000
TOTAL	10,723,000	488,000	461,000	$11,672,000
Annual Costs				
Interest & Amortization	965,000	44,000	42,000	1,051,000
Operation & Maintenance	26,000	36,000	20,000	82,000
TOTAL	991,000	80,000	62,000	1,133,000
Annual Benefits	1,479,000	202,000	238,000	1,919,000
Net Benefits	488,000	122,000	176,000	786,000
Benefit:Cost Ratio	1.5:1	2.5:1	3.8:1	1.7:1

DESCRIPTION OF THE SELECTED PLAN

The selected plan for Federal improvement at Canaveral Harbor is Plan A which includes navigation and recreation. The proposed project for navigation is for a depth of 39 feet and width of 400 feet in the Inner Entrance Channel. That plan is the NED Plan which enables more efficient and safer vessel movements with deeper depths and wider channel. It is the navigational plan which maximizes net National Economic Development (NED) benefits (provides the greatest increment of transportation savings over project costs). The proposed project for recreation includes the development of the Canaveral Lock Park and improvements to the existing Jetty Park for a fishing walkway on the jetty.

SELECTED PLAN - NAVIGATION

The features on the selected navigation plan, shown on plate 3, are compared to those on the existing Federal harbor project in the below tabulation. Details on the environmental impacts of the selected plan are contained within the ENVIRONMENTAL IMPACT STATEMENT (EIS).

Project Feature	Existing Federal Dimensions	Recommended Dimensions	Required Depth
U.S. Navy Entrance Channel	44' X 400'	44' X 400'	N/A
Civil Works			
Outer Entrance Channel	37' X 400'	41' X 400'	42'
Inner Entrance Channel	36' X 300'	40' X 400'	41'
Middle Turning Basin	35' X Irregular Shape	39' X 1,200' Diameter, Remainder 35'	40'
West Access Channel Cut A Sta 0+00-18+00	31' X 400'	39' X 400	40'

DESIGN VESSEL

Vessel usage at Canaveral Harbor in the foreseeable future provides the basis for establishing the design vessel. From the prospective economic conditions the larger vessels with a project are expected to vary from 30,000 to 70,000 deadweight tons. From those vessels the composite design vessel comes from the larger tankers and bulk cement carriers and has a length of 750 feet and beam of 100 feet. The maximum draft of that vessel is about 40 feet.

CHANNEL DEPTH DESIGN

Depth is one of two main elements in the design of a channel. In evaluating depth, wave conditions, as well as transiting vessels' drafts, were primary factors in the analysis. Allowance for wave action is generally one half of the anticipated wave height which for Canaveral Harbor is considered to be about 2 feet (4-foot wave height) in the Outer Entrance Channel and about 1-foot (2-foot wave height) in the Inner Entrance Channel. This condition occurs or is exceeded about 30 percent of the time. The additional depth of 2 feet is, therefore, recommended for the Outer Entrance channel and 1-foot for the Inner Entrance Channel.

Tidal Influences

The mean tidal range for the interior channel is 3 feet, and 1 foot of additional depth would be available much of the time; however, the impact of tides on vessel operations at Canaveral is minor. The greater depth available using tidal advantage is not a significant factor for the vast majority of vessels calling at Canaveral. This is evident from the small number of vessels calling at drafts greater than 33 feet (27 vessels in 1988).

A number of factors have been identified which act to minimize the use of tidal advantage at Canaveral. These include the narrow range of tidal variation, which increases the likelihood of tidal delays and aversion to delays by vessel operators, particularly those currently engaged in two-port discharges of cargo.

These factors contribute to the decision by vessel operators to minimize tidal delays. The loaded drafts of vessels calling at Canaveral reflect the policies of the shipping lines. Those policies are shaped by the demands of the market for transportation services. The shipping lines, acting in accordance with the desires of their customers, minimize the potential for tidal delays at Canaveral by loading vessels only to drafts which do not require tidal advantage to call at the port.

Hull Clearance

The harbor pilots generally require that the maximum draft for port transit allow for 2 feet of clearance between the static draft of the vessel and the channel bottom. Examination of Canaveral Port records of loaded vessels confirmed that regular visits are at static drafts up to 33 feet under existing conditions. Comparison of the 35-foot authorized depth to the static draft of 33 feet gives a difference of 2 feet under existing conditions. It must be noted, however, that this estimate refers to static drafts, as opposed to drafts underway which will generally be greater. Vessel drafts increase when underway because the ship sinks lower in the water due motion and dynamic forces on the hull. The propeller's motion also works to draw the rear or stern of the vessel down farther (squat) in the water. The large dry bulk vessels and tankers, calling at Canaveral loaded to 33 feet (static draft), tend to have sinkage and squat of approximately 1 foot when underway. This leaves a safety clearance of 1 foot between the vessel hull underway and channel bottom.

The Corps' Engineer Manual on Hydraulic Design of Deep-Draft Navigation Projects (EM 1110-2-1613) provides a methodology for calculating the channel depth needed for a vessel in motion to ensure risk-free operation. A risk-free operation may be assumed when the conditions, derived from application of the EM criteria, are met. The difference, using that criteria, between the vessel hull in motion and the channel bottom, is 2 feet for safety clearance. Allowing one foot for sinkage and squat, the corresponding risk-free draft for a static vessel at Canaveral under the without project condition would be 32 feet. In 1988 vessels at static drafts greater than 32 feet made 52 trips. Since those vessels called at drafts greater than the risk-free static draft and vessels with static drafts of 33 feet are able to call at Canaveral routinely without using tidal advantage, it is apparent that current operating practices at Canaveral are not risk-free.

Economic Evaluation

The projected 1993 vessel fleet, using the harbor with a deeper project to 39 feet, will make an estimated 21 trips with static drafts of 37 feet. The vessels at that draft will make an estimated 35 trips in 2043. Those trips would be not be risk-free. The evaluation of transportation savings for those vessels and project costs at different depths uses the observed without project safety clearance of 1 foot with an allowance of 1 foot for sinkage and squat on vessels in motion. Corps of Engineers' document EP 1105-2-45 addresses risk reduction benefits. The basic premise for that type analysis is that if marginal transportation cost savings for the design vessel under certain environmental conditions exceed risk cost, then an incentive exists to employ deeper drafts. The EP provides a method for calculating risk reduction benefits. Analysis of potential risk reduction benefits and costs indicates that additional deepening to eliminate risk is not economically justified.

Economic evaluation of future vessel fleets resulted in an optimum Inner Entrance Channel (west of the Trident basin and east of the middle basin) of 40 feet, turning basin depth of 39 feet and Outer Entrance Channel depth of 41 feet. This selection would provide enough depth to allow all vessels with drafts of 37 feet or less to transit the harbor fully loaded.

CHANNEL BOTTOM WIDTH DESIGN

The second element in the design of a channel is the bottom width. In that analysis the channel bottom width, ship traffic, vessel size, safety problems, existing shoreline uses, existing conditions, and environmental conditions were major considerations. As part of the authorized project, the Outer Entrance Channel has an existing bottom width of 400 feet as does the access channel to the West Basin at the port. The pilots have indicated no problem with those channel widths.

Adjacent Facilities

The Inner Entrance Channel is the only segment with a width of 300 feet. In that reach the Canaveral Port Authority has several cruise ship piers located about 230 feet from the existing channel edge, as shown on plate B-1 in appendix B. Property on the north side of that channel belongs to U.S. Air

Force and plans exists for a berth in that area as shown on plate B-1. The plans show that berth to be approximately 220 feet from the existing bottom edge. To assist the pilots in navigating in that reach, the Port Authority requested widening from the existing 300 feet to 400 feet.

Traffic Considerations

Based on the existing vessel traffic, smaller vessels with drafts of 18 feet or less comprise about 70 percent of the total, and average 2.5 trips a day. The larger vessels average about 1.1 trips a day. With the existing channel width the smaller vessels have two-way traffic without problem. It is the combination of use that sometimes causes problems. About the only passing situations, which occur within the Inner Entrance Channel, involve deep-draft vessels and smaller commercial fishing boats using the harbor. The biggest problem is when those boats are loaded. In that condition they move very slow and sometimes are unstable. The larger commercial vessels have trouble getting around them in the existing channel. If the larger vessel has to slow down, it becomes more difficult to maneuver. However, in the existing channel there is sufficient width for the smaller commercial fishing vessels to move into shallower water and enable the larger vessel to pass in the deeper area.

Other Considerations

The mean wind speed in the area is about 8 knots and is the only natural force that presents a maneuver problem. There are no cross currents and very little tidal flow to cause a problem. Very little documentation exists on vessel delays, damage, or close calls associated with the existing channel conditions at Canaveral Harbor. The pilots have maintained a very good record but indicate that navigation under certain conditions is getting more difficult. The main area of concern is the 300-width in the Inner Entrance Channel. In that area of concern, one-way traffic is projected to remain the main design condition for the larger deep-draft design vessel with a length of 750 feet and beam of 100 feet and loaded draft of 37 feet.

With the cruise ships at berth along the south side of the Inner Entrance Channel, the pilots proceed very carefully along that reach. Wind conditions sometimes add to the maneuver problem. The width of 400 feet will provide a wider, deep channel to enable the larger vessels to move safely when maneuverability becomes poorer at slower speeds or winds become a problem. The 400-foot width provides a 200-foot maneuver lane and 100 feet in each of the bank clearance lanes for safe passage.

Selection

The Canaveral Port Authority and port pilots concur that the proposed width will provide safer conditions for transit. They do not feel that a simulation model will provide any meaningful information that will assist in an incremental assessment of safety. A 50-foot additional width will be added to both the north and south sides of the channel extending the 300-foot width to 400 feet from the Trident basin to the middle basin (a distance of 3,700 feet). That widening provides for the least amount of excavation in the channel and keeps the channel more in the center of existing and prospective piers on each side.

TURNING BASIN

Design criteria in EM 1110-2-1613 and Engineer Regulation (ER) 1110-2-1404, "Deep Draft Navigation Project Design", for turning basins call for a diameter of 150 to 200 percent of the vessel length. The design vessel length for determining the size of the turning area in the middle basin is 750 feet. That length ship would require a basin 1,125 to 1500 feet in diameter.

Current Usage

The turning area in use for deep-draft navigation is in the southwest portion and comprises about 50 percent of the total Middle Basin area. The remaining area has depths less than 35 feet for the Navy and Air Force to access their berths. The wharf on the northeast side has a restricted area that extends about 130 feet into the water from it face.

Pilots prefer to turn ocean-going vessels on entering the harbor from the east rather than on leaving. This enables them to take advantage of the vessels momentum for a more efficient turning operation. Turning the vessel also helps slow the forward progress of it in preparation for berthing. With the civilian berths located to the south and west of the Middle Basin, it is natural for the main turning area to be in the southwest with vessels approaching from the east to make the turn. The pilots confirmed this in the plots of their turning maneuvers for entering the various civilian berths at the port.

Proposed Basin

The proposed basin and access channel occupies about 54 percent of the total Middle Basin area. The channel from the inner channel reach continues to widen in the Middle Basin to ease the turn into the proposed basin shown on plate 3. Based on the pilot's plotted vessel data, current and prospective traffic this should not have a problem. There are no cross currents in the basin area and available records indicate no documentation of accidents or damage in making the turning maneuver. The vessels using the port now are essential the same size as prospective vessels with improvement only loaded deeper. The proposed basin provides adequate space for turning the design vessel considering tug usage and/or bow thrusters on some vessels.

NAVIGATION AIDS

The U.S. Coast Guard is responsible for providing and maintaining navigation aids. During the study, the Coast Guard was contacted to ascertain their views regarding the Plan A channel widening alignment and the alternative Plan B alignment. The Coast Guard expressed a preference for the Plan A alignment, over the Plan B alignment. Plan B would require relocation of the Canaveral Harbor Entrance Channel Range Front and Rear Lights at an estimated cost of $18,000. The selected plan, Plan A, requires no modification of the existing aids to navigation system at Canaveral.

CONSTRUCTION

The selected plan would involve the removal of about 1.0 million cubic yards of unclassified material, primarily silt and clay with some sand. The most economical method of removal is with clamshell excavation and placement into a hopper barges for transport to the ocean disposal site designated by EPA approximately 6 nautical miles southeast of the entrance to Canaveral Harbor. Prior to new work dredging, the maintenance quantities will be estimated so that removal can be made a Federal expense under the existing project authorization. The project dredging could be done under one contract or under separate contracts.

Widening the existing Inner Entrance Channel would necessitate the removal and replacement of stone protection (riprap) at local expense on both the north and south sides of the channel. A crane on a barge would be used to perform that work on the north side. On the south side of the channel, stone would be removed by a crane working from shore and loaded onto dump trucks for hauling and dumping at a designated stockpile in the vicinity. When dredging work is complete, salvageable stone would be replaced and the remaining stone would be placed on a barge and hauled to the ocean disposal site.

RELOCATIONS

Widening the inner reach of the entrance channel would also require several relocations. The finger pier (mooring dolphin) on the northeast side of the middle turning basin near the channel needs relocation from the proposed channel area. A cable crossing needs to go deeper for the proposed channel. The existing dike and berm along the north side of the inner channel needs relocation requiring the excavation and placement of about 32,000 cubic yards of material. The dike and berm work would be accomplished from the shore. That material would be excavated with a dragline, placed in layers and compacted.

OPERATION AND MAINTENANCE

Canaveral Harbor is currently maintained to project depths of 31 and 35 feet. Deepening the project to 39 feet would have a minimal effect on annual maintenance costs for navigation. Extending the Civil Works entrance channel is the only navigation feature that produces incremental annual operation and maintenance costs. The estimated amount is $26,000 in annual maintenance costs to extend the Civil Works entrance channel from the 37 to the 41-foot contour. There are no incremental costs for the remaining navigation features since the selected plan will also use 1-foot of advanced maintenance like the existing Federal harbor.

ENVIRONMENTAL

The selected plan has been evaluated and does maximize net NED benefits consistent with the Federal objective of protecting the nation's environment pursuant to national environmental statues, applicable executive orders, and other Federal planning requirements. There are no areas of controversy nor unresolved issues. The plan is consistent with the Federal Coastal Zone Management Act and State Coastal Management Program. The sponsor obtained State Water Quality Certification on January 22, 1991, for the dredging at Canaveral Harbor.

About 87 acres of channel bottom will be dredged. Using a clamshell dredge may result in spillage in the immediate area and turbidity plumes can occur with tidal movement. Turbidity monitoring during construction is required to insure applicable Federal and State water quality standards are met at all times. Some noise and combustion exhaust will occur during dredging and will tend to blend with ongoing port activities for little or no net impact. The area does not have air quality problems nor an EPA-designation for minimum air quality attainment. Almost constant breezes dissipate exhaust gases. Beach camping and residences are well outside the project area for any consequential effects.

Several species of whales may occur in the vicinity of the offshore disposal area, at least seasonally. Sea turtles utilize the beach north and south of the Outer Channel Entrance for nesting during the summer months. Manatees can be found in the harbor area. There is no designated critical habitat nor significant wildlife habitat in the project area. The Fish and Wildlife Service and the National Marine Fisheries Service both concur with the determination of no effect on endangered species provided construction and maintenance precautions will be incorporated in the project plans and specifications.

ECONOMIC SENSITIVITY

The variables which provided the justification for the selected plan were adjusted to determine the sensitivity of economic feasibility. Data based on actual physical values, such as vessel characteristics, or derived from historical averages, were not expected to fluctuate significantly over time. Items which were evaluated included projections of future tonnage, vessel fleet distributions and initial construction costs. Future tonnages and the distribution of tonnage within the fleet was then held at the 1993 level. This analysis resulted in the economic values shown in table 29 for the selected plan.

Holding the tonnage constant at the 1993 level and using the projected future fleet results in average annual benefits estimated at $1,204,000. This estimate is $278,000 more than the annual cost of the project and gives a benefit to cost ratio of 1.3 to 1.

Allowing tonnage to increase and holding the distribution of vessels constant at the levels of the 1993 fleet results in average annual benefits estimated at $1,309,000. This estimate is $383,000 greater than the annual cost of the project and gives a benefit to cost ratio of 1.4 to 1. This result indicates that benefit estimates are relatively more sensitive to the projected increase in tonnage than to projected changes in vessel distributions in the projected fleets.

TABLE 29

ECONOMIC SENSITIVITY
TONNAGES AND VESSEL DISTRIBUTION HELD CONSTANT

Sensitivity Scenario	Net Annual Benefits	Benefit to Cost Ratio
Tonnage @ 1993 Level	$278,000	1.3 to 1
Vessel Fleet @ 1993 Distribution Level	383,000	1.4 to 1
Tonnage @ 1993 Level and 1993 Vessel Fleet Distribution	277,000	1.3 to 1

Holding the tonnage constant at the 1993 level and also holding the distribution of vessels constant at the levels of the 1993 fleet results in average annual benefits estimated at $1,203,000. This estimate is $277,000 more than the annual cost of the project and gives a benefit to cost ratio of 1.3 to 1.

MULTIPORT ANALYSIS

The study area for multiport analysis is defined as the hinterland served by Canaveral Harbor and the nearest competing ports to the north and south, i.e., Jacksonville and Port Everglades, respectively. The majority of cargo handled by the Canaveral Harbor is bulk cargo. Liquid bulk, primarily fuel oil and gasoline tonnage is consumed by power plants located in the immediate vicinity of Canaveral and motorists in central Florida. Building cement is distributed throughout the central Florida area. Scrap metal is collected throughout the area and consolidated at Canaveral for shipment overseas. With rail and highway systems Canaveral provides intermodal connections to the immediate central Florida area, remainder of Florida, and southeastern United States. The subsequent paragraphs discuss the economic impacts on competing ports with improvement of Canaveral Harbor.

Port Everglades, Florida

Port Everglades, the largest seaport in acreage on Florida's lower east coast, is located at the adjoining city limits of Fort Lauderdale, Hollywood and Dania, 23 miles north of Miami and 312 miles south of Jacksonville. Port Everglades has a current authorized depth of 42 feet which serves numerous dry bulk, liquid bulk and container berths. Major commodities at Port Everglades include all four of the major commodities shipped through Canaveral Harbor. The 1988 Port Everglades Master Plan provides information defining the primary market area served by Port Everglades. That area includes 12 south Florida counties, none of which is included in the primary or secondary market area (study area) for Canaveral Harbor. For this reason, it is unlikely that any existing or potential future tonnages would be diverted through Canaveral as a result of the improvement.

Jacksonville Harbor

Jacksonville Harbor is located on the northeast coast of Florida, 150 miles north of Canaveral Harbor and 125 miles south of Savannah, Georgia. Jacksonville Harbor has a current authorized depth of 38 feet serving numerous dry bulk, liquid bulk and container berths. Major commodities at Jacksonville include gasoline and fuel oil; however, relatively little building cement or scrap (354,424 tons of building cement and 33,967 tons of scrap at Jacksonville in 1987 compared to 610,528 tons of building cement and 177,056 tons of scrap at Canaveral in the same year). The Jacksonville market for the four major Canaveral commodities, like Port Everglades, does not overlap the Canaveral market area. For this reason, it is unlikely that any existing or potential future tonnages would be diverted through Canaveral as a result of the improvement.

Deepening to 39 feet will result in reduced transportation costs for the major commodities shipped through Canaveral Harbor. The major commodities shipped through Canaveral Harbor either originate in or are destined for the Canaveral/Orlando market area. Shipments of those same commodities to and from Port Everglades and Jacksonville are similar, in that they originate in or are destined for locations near those ports. A 39-foot channel depth at Canaveral will not permit vessels to call at deeper drafts than are currently allowed by existing channels at Port Everglades and Canaveral. For this reason, deepening at Canaveral will not lead to potential cost reductions for cargoes currently routed through Port Everglades and Jacksonville. Improvements at Canaveral Harbor are not expected to lead to diversion of liquid bulk or dry bulk cargo from either Port Everglades or Jacksonville.

SELECTED PLAN - RECREATION

LOCK PARK

The Lock Park improvement plan will provide picnic shelters, a play structure, an open play area, a small dock for fishing, an interpretive sign, a short boardwalk to a dock on an inner lagoon for nature observation, restrooms, and a parking lot. A bike path (5 feet wide) will run for 1,650 feet along the barge canal to provide access to the county-run boat ramp/mini-park located on adjacent property ease of the lock. An observation tower could be constructed as a locally financed option. The area would be fenced to separate recreation activities from lock operations and would have a separate entrance for the public.

Rather than competing with the existing activities at the Jetty Park, the proposed development at the Lock Park will offer an environmental education emphasis relative to the functioning of the lock on the barge canal and to the nearby marsh communities. It will provide an alternative for those visitors who aren't inclined to swim or camp on the beach front, or to fish from the jetty. The objective in the development of this park is to utilize a scenic site that has not been managed for public recreational purposes until now.

JETTY PARK

The Jetty Park fishing walkway plan of improvement will modify approximately 1600 feet of the south jetty to include paving, a fish cleaning station, guardrail with recessed lighting, and an entrance deck interconnecting the walkway with existing recreation facilities. Modification of the south jetty for use as a fishing walkway will be extended by 500 feet.

OPERATION AND MAINTENANCE

The recreational facilities included in the selected plan would require local funding for operation and maintenance. It is estimated that $36,000 would be needed annually to maintain the Lock Park and an additional $20,000 would be needed annually to maintain the fishing walkway. The total annual maintenance cost is $56,000 for recreation. Additional discussion and information on operation and maintenance can be found in appendix A.

SELECTED PLAN - COST ESTIMATE SUMMARY

The estimated first costs summarized in table 30 are based on September 1989 price levels. The navigation costs are based on the extraction of new work material only. Prior to the commencement of a dredging contract for the project deepening, the maintenance quantities for the existing project will have to separated from the new work quantities. The maintenance quantities would be removed at Federal expense under the existing project authorization. The project dredging could be done under one contract or under separate contracts.

TABLE 30

ESTIMATED FIRST COSTS - RECOMMENDED PLAN

ACCOUNT CODE	ITEM	TOTAL COSTS
02.-.-.-	RELOCATIONS	
	Utilities, Marine Cable Crossing	$912,500
	Site Work, Marine Finger Pier	62,500
	Site Work, North Side Dike	96,000
	Structures, North side riprap	350,000
	Structures, South side riprap	427,000
12.-.-.-	DREDGING	
	Channels and Middle Turning Basin	6,223,000
	Berthing Areas and access to them	854,000
14.-.-.-	RECREATIONAL FACILITIES	
	Jetty Fishing Walkway	386,000
	Canaveral Harbor Lock Park	416,000
	TOTAL CONSTRUCTION COSTS	$9,727,000
01.-.-.-	LANDS AND DAMAGES	234,000
30.-.-.-	PLANNING, ENGINEERING AND DESIGN	778,000
31.-.-.-	CONSTRUCTION MANAGEMENT	680,000
	TOTAL PROJECT COSTS	$11,419,000

PLAN IMPLEMENTATION

To implement the plan for deepening Canaveral Harbor and widening the Inner Entrance Channel, certain conditions and requirements must be provided for Federal participation. A discussion of those responsibilities is in the subsequent paragraphs.

STATE REQUIREMENTS

Authorization of the selected plan to modify Canaveral Harbor could be accomplished in accordance with Section 201 of the 1965 Flood Control Act, as amended. If that occurs, Water Quality Certification will be required from the State of Florida. The Canaveral Port Authority does have a permit application on file with the Florida Department of Environmental Regulation at this time for dredging that would include the work in the selected plan.

LOCAL ASSURANCES

Public Law 99-662, the Water Resources Development Act of 1986 requires that before initiation of construction for a navigation project for the harbor, the Secretary of the Army and the non-Federal sponsor shall enter into a cooperative agreement. In this agreement the Canaveral Port Authority, acting as the local assurer would be required to:

a. Pay 25 percent of the cost of construction of the navigation features of the project during construction;

b. Pay an additional 10 percent of the cost of the general navigation features of the project in cash over a period not to exceed 30 years, at an interest rate determined pursuant to the Section 106 of Public Law 99-662. The value of lands, easements, rights-of-way, relocations, and dredged material disposal areas would be credited toward this required payment;

c. Pay 50 percent of the cost of construction of the recreational features of the project during construction;

d. Hold and save the United States free from damages due to the construction or operation and maintenance of the project, except for damages due to the fault or negligence of the United States or its contractors;

e. Acquire the necessary lands, easements, rights-of-way, and dredged material disposal areas with all necessary retaining dikes, bulkheads, and embankments, or the cost of such retaining works;

f. Perform or assure the performance of all relocations and alterations of utilities, pipelines, dikes, mooring dolphin, cables, and sewer outlets necessary to carry out the project;

g. Provide and maintain adequate public docks, terminals, and transfer facilities open to the use of all on equal terms, and provide and maintain depths in berthing areas and local access channels serving the terminals commensurate with project depths;

h. Prohibit erection of any structure that would encroach on the Federal channel as authorized; and

i. Operate, maintain, replace, and rehabilitate the recreational facilities at no coast to the Federal Government; and

j. Pay all costs incurred with the cleanup of hazardous materials located on project lands (including submerged lands) and covered under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). In addition, the local sponsor shall be required to fulfill all of its non-Federal responsibilities, including the dredging of berthing areas or access channels, and operation and maintenance of any required disposal facilities, in a manner so that liability will not arise under CERCLA.

FEDERAL COSTS

The first and annual costs for implementation of the selected plan were apportioned based on existing laws and regulations as contained in the above items of local cooperation. Generally, the Federal government would be responsible for 75 percent of the initial construction costs of the navigation features of the project, 50 percent of the initial cost of the recreation features, and 100 percent of the navigation aids as well as 100 percent of the annual operation and maintenance costs. The Federal cost are shown in table 31.

NON-FEDERAL COSTS

Local interests would be required to provide a cash contribution of 25 percent of the initial construction costs and the non-Federal costs such as dredging the berthing area, relocating the utility cable, and any other relocation costs required for project implementation. Local interests are also required to pay an additional 10 percent of the cost shared general navigation features less local costs for lands, easements, rights-of-ways, relocations, and disposal areas over a period not to exceed 30 years. Since local costs for relocations work exceed that 10 percent requirement, a credit does apply in this case eliminates the last 10 percent non-Federal cost sharing requirement. A new local cooperation item addresses non-Federal responsibilities for hazardous materials on project lands as covered under the Comprehensive Environmental Responses, Compensation and Liability Act (CERCLA). The sponsor is responsible for cleanup costs on project lands, berthing areas, and access channels during initial construction as well as maintenance and operations except for such cleanup or response costs resulting from the negligence of the Government or its contractor. Using the above allocations, the distribution of costs between Federal and non-Federal interests is as shown in the table 31.

LOCAL SUPPORT

The sponsor, Canaveral Port Authority, has provided a letter of support for the selected plan as presented in this report. That letter is in appendix G.

The sponsor has also provided a financial analysis on how the port plans to pay for its share of the costs and other required work. The sponsor has been very supportive of the study efforts undertaken and the Federal participants greatly appreciate that cooperative effort.

TABLE 31

FEDERAL AND NON-FEDERAL COST SHARING
FOR THE SELECTED PLAN

(in thousands of dollars, $000)

ACCOUNT CODE	ITEM	TOTAL COSTS	FEDERAL	NON-FEDERAL
01.-.-.-	LANDS AND DAMAGES	$234.0	$0.0	$234.0
02.-.-.-	RELOCATIONS			
	Utilities, Marine Cable Crossing	$912.5	$0.0	$912.5
	Site Work, Marine Finger Pier	62.5	0.0	62.5
	Site Work, North Side Dike	96.0	0.0	96.0
	Structures, North Side Riprap	350.0	0.0	350.0
	Structures, South Side Riprap	427.0	0.0	427.0
	Planning, Engineering and Design	148.0	0.0	148.0
	Construction Management	129.0	0.0	129.0
	SUBTOTAL, RELOCATIONS	$2,125.0	$0.0	$2,125.0
12.-.-.-	DREDGING, CORPS OF ENGINEERS			
	Channels and Turning Basin	$6,223.0	$4,667.3	$1,555.7
	Planning, Engineering and Design	498.0	373.5	124.5
	Construction Management	435.0	326.2	108.8
	SUBTOTAL, DREDGING FEDERAL	$7,156.0	$5,367.0	$1,789.0
12.-.-.-	DREDGING, NON-FEDERAL			
	Berthing Areas and access	$854.0	$0.0	$854.0
	Planning, Engineering and Design	69.0	0.0	69.0
	Construction Management	60.0	0.0	60.0
	SUBTOTAL, DREDGING NON-FEDERAL	$983.0	$0.0	$983.0
14.-.-.-	RECREATIONAL FACILITIES			
	Jetty Fishing Walkway	$386.0	$193.0	$193.0
	Canaveral Harbor Lock Park	416.0	208.0	208.0
	Planning, Engineering and Design	63.0	31.5	31.5
	Construction Management	56.0	28.0	28.0
	SUBTOTAL, RECR. FACILITIES	$921.0	$460.5	$460.5
	TOTAL PROJECT COSTS	$11,419.0	$5,827.5	$5,591.5

PUBLIC VIEWS AND COMMENTS CONCLUSIONS AND RECOMMENDATIONS

PUBLIC VIEWS AND COMMENTS

The draft feasibility report and environmental impact statement (EIS) went to various public agencies and individuals for review on June 25, 1990. The review period ended on August 13, 1990, which was the deadline for all comments on the report and EIS. The response letters, received from the various agencies and interested parties, are in appendix G. In general, the responses offered no objections to the proposed modifications of Canaveral Harbor. The subsequent paragraphs summarize the significant points in the responses.

U.S. Department of the Interior. The department was in general agreement with the documents and recommended use of low pressure, sodium vapor lighting to be recessed along the fishing walkway as part of the selected Jetty Park Plan.

Response. Low pressure,sodium vapor lighting will be recessed along the fishing walkway as part of the Jetty Park Plan.

U.S. Department of the Air Force. The Air Force advised that the plan would have no adverse effect on its operation.

Response. Comment noted.

U.S. Environmental Protection Agency. The department provided a rating of EC-2 on the proposed plan. That rating means there is a degree of concern with putting fine grained sediments in the ocean disposal site until those sediments can be tested. Items a-h need documentation in the Section 103 Ocean Disposal Evaluation Report.

Response. Additional testing of the material to be dredged will be done prior to construction. This will ensure the availability of test data acquired within five years prior to construction. Section 103 revised to show documentation.

U.S. Department of Housing and Urban Development. The department indicated no significant adverse impact on any HUD programs.

Response. Comment noted.

Florida State Clearinghouse. The State Clearinghouse finds the project consistent with the Florida Coastal Management Program but noted that the Corps is required to submit a consistency determination at each major point of decision-making for State review.

Response. This is consistent with Corps policy of close coordination with State agencies in planning, design, and construction of projects.

Florida Department of Environmental Regulation. The agency indicated the draft EIS did not provide sufficient information on the status of the ocean disposal site and the feasibility report did not evaluate the impacts on the sea turtles. Dimensions of the project in the feasibility report were not clear.

Response. The feasibility report and EIS have been revised to provide more information and clarification of the concerns.

Florida Department of Natural Resources. The agency expressed concerns on the need for a map to show the core boring locations, location information on the existing dike (proposed for relocation) along the north side, and cross-sectional views on the channel and dike. The possibility of some material in the dike relocation area being suitable for beach fill should be acknowledged in the feasibility report and investigated further in the Design Phase of the project. Location of the ocean disposal area does not appear correct and should be checked before submitting final report.

Response. Appendix C revised to include a map of the core boring locations. Appendix B revised to include a drawing of the channel reach to be widened along with a typical cross-section of the channel and dike to show the relationship. The land on the north side of that channel belongs to the Air Force. The amount of suitable material and its use for beach fill would be a matter of negotiation between the sponsor and the Air Force. The Corps is working with EPA on the final designation of the ocean disposal site.

Florida Department of State. The Division of Historical Resources acknowledged the inclusion of its recommendations in the draft and has no concerns as long as that recommendation goes into the final EIS.

Response. Comment noted.

Florida Department of Transportation. The agency found no specific problems with the proposed project.

Response. Comment noted.

CONCLUSIONS

Improvements for both navigation and recreation were objectives of the study presented in this report as a final response to the Congressional resolutions. The study included a number of alternatives to arrive at a plan that met the needs of navigation and recreation in an economic and environmentally acceptable manner.

To improve navigation, several combination of channel and turning basin depths, channel width alternatives, local channel maintenance, dredged material disposal options, and no action were considerations for modifying the existing Canaveral Harbor project. Feasible improvements were evident except for maintenance of locally provided depths in the West Basin and access channel. Maintenance of those features could not be economically justified at this time. A review of ship handling problems in the existing Middle Turning Basin and inner channel reach indicated the proposed turning area and channel widening were acceptable solutions to pilot concerns with improved depth. The sponsor and pilots concur that a ship simulation study is not necessary to further address design conditions. The evaluation process on considered navigation alternatives resulted in the selection of the National Economic Development (NED) plan for recommendation. The NED Plan has a total first cost of $10,498,000 and average annual equivalent benefits and costs of $1,479,000 and $991,000, respectively, for a benefit-to-cost ratio of 1.5 to 1. That plan maximizes net NED benefits consistent with the Federal objective of protecting the nation's environmental statues, applicable executive orders, and other Federal planning requirements. No further ship simulation study on that plan is recommended. Modification of the authorized project for navigation at Canaveral Harbor includes the following changes:

o Assumption of maintenance in the outer reach of the entrance channel to 41 feet;

o Deepening the inner reach of the entrance channel to 40 feet and widening it to 400 feet;

o Deepening a 1,200-foot diameter turning area in the Middle Turning Basin to 39 feet; and

o Deepening the first 1,800 feet of channel west of the Middle Turning Basin to 39 feet.

For recreation the existing Jetty Park and the area around the barge lock were considerations to improve recreation. The selected plans for recreation include the development of a Lock Park and the addition of a jetty fishing walkway in the Jetty Park area on port property. The total project for recreation has a total first cost of $921,000. The average annual equivalent benefits and costs are $440,000 and $142,000, respectively, for a benefit-to-cost ratio of 3.1 to 1.

Both navigation and recreation are economically justified as individual increments. The improvements for navigation will provide safer and more economically ship movements at the port. The selected plan is in the overall Federal and public interest as well as being the most economically efficient. No other improvements are warranted at this time. Implementation of the study conclusions are subject to the provisions contained in the following recommendations.

RECOMMENDATIONS

I recommend that the existing project for deep-draft navigation at Canaveral Harbor, authorized by the river and Harbor Acts of March 1945 and October 1962, be modified to provide for implementation of a Federal project for deeper commercial navigation and additional recreational facilities, in accordance with the plan selected herein, with such further modifications thereto as in the discretion of the Commander, HQUSACE, may be advisable; at a first cost to the United States presently estimated at $5,827,500; with annual operation and maintenance costs to the United States presently estimated at $82,000.

These recommendations are made with the provision that the exact amount of non-Federal contribution shall be determined by the Commander HQUSACE prior to project implementation, in accordance with the following required items of cooperation to which the non-Federal sponsor shall agree to perform prior to implementation:

a. Pay 25 percent of the cost of construction of the navigational features of the project during construction;

b. Pay an additional 10 percent of the cost of the general navigational features of the project in cash over a period not to exceed 30 years, at an interest rate determined pursuant to Section 106 of Public Law 99-662. The value of lands, easement, rights-of-way, relocations, and dredged material disposal areas would be credited toward this required payment;

c. Pay 50 percent of the cost of construction of the recreational features of the project during construction;

d. Hold and save the United States free from damages due to the construction and maintenance of the project, except for damages due to the fault or negligence of the United States or its contractors;

e. Acquire the necessary lands, easements, rights-of-way, and dredged material disposal areas with all necessary retaining dikes, bulkheads, and embankments, or the cost of such retaining works;

f. Perform or assure the performance of all relocations and alterations of utilities, piers, dikes, pipelines, cables, and sewer outlets necessary to carry out the project;

g. Provide and maintain adequate public docks, terminals, and transfer facilities open to the use of all on equal terms;

h. Provide and maintain depths in berthing areas and local access channels serving the terminals commensurate with project depths;

i. Operate, maintain, replace, and rehabilitate the recreational facilities at no cost to the Federal Government; and

j. Prohibit erection of any structure that would encroach on the Federal channel as authorized; and

k. Pay all costs incurred with the cleanup of hazardous materials located on project lands (including submerged lands) and covered under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). In addition, the local sponsor shall be required to fulfill all of its non-federal responsibilities, including the dredging of berthing areas or access channels, and operation and maintenance of any required disposal facilities, in a manner so that liability will not arise under CERCLA.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program not the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding.

BRUCE A. MALSON
Colonel, Corps of Engineers
Commanding

[First endorsement]

CESAD-PD-P (CESAJ/Aug 90) (10-1-7a)
SUBJECT: Canaveral Harbor, Florida - 81240

Cdr, South Atlantic Division, Corps of Engineers, Room 313, 77 Forsyth Street, SW., Atlanta, Georgia 30335-6801

SEP 28 1990

FOR BOARD OF ENGINEERS FOR RIVERS AND HARBORS, KINGMAN BUILDING, FORT BELVOIR, VIRGINIA 22060-5576

I concur in the recommendations of the District Engineer.

Encl

JOHN F. SOBKE
Major General, USA
Commanding

FINAL ENVIRONMENTAL IMPACT STATEMENT

CANAVERAL HARBOR, BREVARD COUNTY, FLORIDA
NAVIGATION IMPROVEMENTS

1. The responsible lead agency is the U.S. Army Engineer District, Jacksonville.

2. Abstract. The Jacksonville District, Corps of Engineers, studied navigation improvements to Canaveral Harbor, Florida. The recommended plan calls for extending the civil works portion of the entrance channel to the 41-foot contour with a 400 foot width, deepening the inner channel to 40 feet and increasing the width to 400 feet, deepening a 1200 foot diameter portion of the middle turning basin to 39 feet and deepening the first 1800 feet of the west access channel to 39 feet. Disposal of approximately 1.0 million yards of predominantly silt and clay would be done in an EPA designated Canaveral Harbor dredged material disposal site in the Atlantic Ocean. Development of the Lock Park and Jetty Park Fishing Walkway are also proposed.

The recommended action represents an extension of established and authorized navigation use and maintenance of the project area, and no new or significant environmental impacts will occur.

NOTE: Information, displays, maps, etc., discussed in the GDM are incorporated by reference into the EIS.

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FINAL
ENVIRONMENTAL IMPACT STATEMENT
NAVIGATION IMPROVEMENTS
CANAVERAL HARBOR, FLORIDA

1.00 SUMMARY

1.01 Major Findings and Conclusions. Navigation improvements considered in this study are in the national interest, and they can be constructed while protecting the human environment from unacceptable impacts.

1.02 A number of alternatives were evaluated to arrive at a plan that met navigation needs for Canaveral Harbor in an economic and environmentally acceptable manner. These included various combinations of channel and turning basin widening and/deepening, dredged material disposal options, and no action. From this evaluation process a recommended National Economic Development (NED) plan emerged that maximizes net national economic development benefits conistent with the Federal objective of protecting the nation's environment pursuant to national environmental statues, applicable executive orders, and other Federal planning requirements. The layout of the harbor and the navigation proposals up to maximum widths and depths are shown in figures 1, 2, and 3. The selected plan recommends that the authorized project for Canaveral Harbor be modified as follows:

- Assumption of maintenance of the entrance channel to 41 feet.
- Deeping and widening the Inner Channel to 40 feet deep by 400 feet wide and assuming maintenance.
- Deepening a 1,200 foot-in-diameter area in the middle Turning Basin to 39 feet and assuming maintenance.
- Deepening the first 1,800 feet of the west access channel to 39 feet and assuming maintenance.
- Disposal of dredged material in an EPA-approved ocean disposal site (figure 4).

Also included in the recommended plan are construction of recreational facilities at Canaveral Harbor Lock Park and the Jetty Park Fishing Walkway.

1.03 Areas of Controversy. There are no areas of controversy.

1.04 Unresolved Issues. There are no unresolved issues.

1.05 **Relationship of the Considered Action to Environmental Protection Statutes and other Environmental Requirements.** **The considered action is in compliance with all applicable environmental protection statutes and other environmental requirements (Table 1).**

1.06 Clean Water Act Section 404 Considerations. Discharge of materials into waters of the United States is not proposed.

1.07 Florida Coastal Zone Management Program Consistency Evaluation. The Florida Coastal Management Program (FCMP) consists of 27 Florida Statutes and five policy statements by the Governor. Of these, the following are applicable to the project.

1.08 Chapter 252 F.S. Public Lands and Property. Information and studies provided in the Feasibility Report and D.E.I.S. show that the planned activity would not violate State laws concerning uses of State lands, restrictions on dredging and filling, marshlands, or riparian rights.

1.09 Chapter 258 F.S. State Parks and Preserves. The relevant part of this statute deals with aquatic preserves. There are no State aquatic preserves within the project area; therefore, the proposed action is in compliance with this statute.

1.10 Chapter 267 F.S. Archives, History and Records Management. Paragraph 4.04 of the EIS states the nature of the work is such that the proposed action will not affect items of archeological and/or historic interest.

1.11 Chapter 370 F.S. Saltwater Fisheries. This statute deals primarily with regulations governing the taking and selling of fish and other marine animals, but includes provisions for protection of marine turtles and manatees, which are federally protected species. Impacts on endangered species are discussed in paragraph 5.01 of the FEIS. Specific precautions will be put into the contract plans and specifications to ensure protection of both sea turtles and manatees. These precautions were coordinated with the FWS and NMFS. The proposed action therefore is in compliance with this statute.

1.12 Chapter 372 F.S. Wildlife. The applicable part of this statute deals with threatened and endangered species. Impacts on protected species are discussed in paragraph 5.01 of the FEIS. The proposed action is in compliance with this statute.

1.13 Chapter 373 F.S. Water Resources. This statute addresses water resource uses and management. Information presented in the FEIS shows that the proposed action is not in conflict with the statute.

1.14 Chapter 380 F.S. Land and Water Management. The relevant part of this statute deals with areas of critical State concern. There are no such areas within the project area.

1.15 Chapter 403 F.S. Environmental controls. This statute deal with the discharge of material in State waters. There will be environmental controls, no placement of material in State waters; therefore, the proposed action is not in conflict with the statute.

1.16 Consistency Statement. It is concluded that pursuant to Section 307(c)(1) and (2) of the Federal Coastal Zone Management Act, the proposed action would be consistent with the Florida Coastal Management Program.

2.00 PURPOSE OF AND NEED FOR CONSIDERED ACTION. The purpose of the considered action is to enable larger ships to carry more cargo at greater drafts, increasing the safety and efficiency of the present harbor operations. Authorization for the study is provided in resolutions adopted by the Committee on Public Works of the United States Senate and the House of Representatives on April 1, 1969, and December 11, 1969, respectively.

2.01 The import and export of bulk commodities at Canaveral Harbor are increasing along with an expanding cruise ship industry. Bulk commodities are reaching such proportions that larger ships with more capacity would be more economical. The smaller vessels capable of using port depths at fully loaded drafts are also becoming more difficult to charter in the world fleet. Light-loading deeper draft ships and making two port discharges are necessary in some instances to enable deliveries at existing harbor depths based on varying competitive and economic situations in the world.

2.02 Owners of bulk vessels in the world fleet are scrapping older, less efficient ships in favor of larger more efficient ones. During 1985 the scrapping or loss of bulk-cargo vessels (excluding those in the Great Lakes trade) totalled 294 ships with a combined deadweight tonnage (DWT) of 9.015 million and an average size of about 30,700 DWT. In that same year, 309 bulk-cargo ships went into service with a total of 13.525 million DWT and an average size of 43,800 DWT.

2.03 From 1960-1962 when the current harbor project was under consideration, the design vessels were T-2 tankers (16,700 DWT) and 19,000 DWT tankers. Those vessels had lengths of 520 to 560 feet, drafts of 30 to 32 feet, and beams of 70 to 75 feet. In 1985 the dry bulk-cargo carriers ranged from 25,000 to 45,000 DWT and petroleum tankers from 25,000 to 50,000 DWT. The dimensions of those vessels ranged from 600 to 750 feet in length, 80 to 106 feet in beam, and 33 to 41 feet in draft.

2.04 The larger vessels frequenting the port have prompted pilots to impose safety restrictions. They no longer allow deep-draft vessels to pass in the 300-foot channel into the port, nor permit deep-draft vessels to pass slower moving commercial scallop boats. Pilots will reduce speed on deep-draft ships to avoid passing a scallop boat. Improvements considered necessary to relieve port congestion include deepening and widening navigation channels.

3.00 RECOMMENDED PLAN. The recommended plan is described below and shown on Figures 1, 2, and 3.

	Currently Authorized Project (Existing Dimensions)	Recommended Plan
a. Civil Works portion of the Entrance Channel		
Depth	37 ft.	41 ft.*
Width	400 ft.	400 ft.
b. Inner channel from the Trident Basin entrance to the middle turning basin		
Depth	36 ft.	40 ft.
Width	300 ft.	400 ft.
b. Middle Turning Basin		
Depth	35 ft.	39 ft.
Diameter	Irregular	1,200 ft.
c. West Access Channel (first 1,800 ft.)		
Depth	31 ft.	39 ft.
Width	400 ft.	400 ft.

*Channel deepened to 44 feet under Navy contract

TABLE 1

RELATIONSHIP OF PLAN TO ENVIRONMENTAL PROJECTION STATUTES
AND OTHER ENVIRONMENTAL REQUIREMENTS

	Selected Plan 1
Federal Statutes	
Archeological and Historic Preservation Act, as amended, 16 USC 469, et seq.	Full(a)
Clean Air Act, as amended, 42 USC 1857h-7, et seq.	Full
Clean Water Act, as amended, (Federal Water Pollution Control Act), 33 USC 1251, et seq.	Full
Coastal Zone Management Act, as amended, 16 USC 1451, et seq.	Partial(c)
Endangered Species Act, as amended, 16 USC 1531, et seq.	Full
Estuary Protection Act, 16 USC 1221, et seq.	Full
Federal Water Project Recreation Act, as amended, 16 USC 460-1(12), et seq.	Full
Fish and Wildlife Coordination Act, as amended, 16 USC 661, et seq.	Full
Land and Water Conservation Fund Act, as amended, 16 USC 4601-4601-11, et seq.	N/A (b)
Marine Protection, Research and Sanctuaries Act, 33 USC 1401, et seq.	Full
National Historic Preservation Act, as amended, 16 USC 470a, et seq.	Full
National Environmental Policy Act, as amended, 42 USC 4321, et seq.	Partial(d)
River and Harbor Act, 33 USC 401, et seq.	Full
Watershed Protection and Flood Prevention Act, 16 USC 1001, et seq.	N/A
Wild and Scenic Rivers Act, as amended, 16 USC 1271, et seq.	N/A
Coastal Barrier Resources Act of 1982	Full
Executive Orders	
Floodplain Management (EO 11988)	Full
Protection of Wetlands (EO 11990)	Full
State Policies	
Chapter 403, Environmental Controls, Florida Statutes	Full
Chapter 253, Public Lands and Property, Florida Statutes	Full
Chapter 258, State Parks and Preserves	Full
Chapter 267, Archives, History and Records Management	Full
Chapter 372, Wildlife	Full
Chapter 373, Water Resources, Florida Statutes	Full
Chapter 370, Saltwater Fisheries	Full
Chapter 380, Land and Water Management	Full
Florida Coastal Zone Management Plan	

a Full Compliance. Having met all requirements of the statute, EO, or other environmental requirements for the current stage of planning.
b Not Applicable. No requirements for the Statute, EO, or other environmental requirement for the current stage of planning.
c Pending State concurrence
d. Pending filing and coordination of the final EIS

3.01 The recommended plan calls for excavation of approximately 1.0 million cubic yards of material that is primarily clay and silt. The dredged material would be disposed of in an EPA-designated Canaveral offshore disposal area. The candidate site proposed by the EPA for permanent status as a disposal site encompasses the existing interim-approved site and is located about 6.5 nautical miles southeast of the jetties (figure 4).

3.02 Recreational Facilities. Recreational facilities proposed include development of the Lock Park and the Jetty Park Fishing Walkway. The Lock Park plan will provide picnic shelters, a play structure, an open play area, a short boardwalk to a dock on an inner lagoon for nature observation, restrooms, and a parking lot. The Jetty Park plan would modify about 1,600 feet of the south jetty to include parking, a fish-cleaning station, guardrail with recessed low-pressure sodium vapor lighting and an entrance deck connecting the fishing walkway with existing facilities. The plan is described in detail in the Recreation Resources Appendix to the Feasibility Report.

4.00 ALTERNATIVES CONSIDERED. Based on discussions with the Canaveral Port Authority and port pilots, consideration was given to the following array of alternatives:

4.01 Entrance Channel. Consideration was given to assuming federal maintenance of the entrance channel from deep water in the Atlantic Ocean to the Trident submarine base. Alternative depths between 37 feet and the existing Navy project depth of 44 feet were evaluated.

4.02 Inner Basin and Channel. Deepening the inner channel between the Trident Basin and the west access channel was analyzed in 2-foot increments between the existing depth of 36 feet to 43 feet. Widening the inner channel from 300 to 400 feet was also considered. Deepening the middle turning basin was analyzed in 2-foot increments from 35 to 42 feet.

4.03 West access channel and turning basin. Deepening of the easternmost 1,800 feet of the west access channel was considered in 2-foot increments from the authorized depth of 31 feet to 41 feet.

4.04 No Action. No action was considered but this would result in a continuation of the underutilization of the port and increased safety problems.

4.05 Disposal Alternatives.

4.06 Beach Disposal. Core borings indicate that the material is predominantly silt and clay with only a small percentage of sand, and is unsuitable for beach disposal. However, if further investigation during the design stage shows beach quality sand is present, disposal of the material on nearby beaches will be considered in coordination with the State.

4.07 Upland Disposal. There are three potential upland disposal sites in the project area. Two are adjacent to the Trident Basin, one to the east owned by the Navy and one to the west owned by the Air Force. Both organizations are reserving these sites for material to be dredged periodically from their respective berthing areas and for emergency maintenance dredging; neither site is available for the material from the deepening project. A third site is located north of the channel and adjacent to the project. This area, however, is under consideration for port expansion in the near future. Because the material to be dredged is unsuitable for construction it is not acceptable in this location. In any case, the poor structural quality of the material precludes dike construction without the use of very expensive methods to enhance its use. Upland disposal of the material is therefore not feasible for the project.

4.08 Ocean Disposal. The existing interim ODMDS lies about 7 nautical miles southeast of the entrance to Canaveral Harbor and about 4 nautical miles from the nearest land. The site has been used numerous times in the past. A proposed candidate site of 2 nautical miles on a side that completely encompasses the interim site is currently undergoing the process of designation as a permanent ODMDS. Depths at the site range from 45 to 53 feet. Specific uses of the site are subject to evaluation and review in accordance with Section 103 of the Marine Protection, Research and Sanctuaries Act (MPRSA). These procedures would include appropriate testing of material to be discharged to ensure conformity with EPA standards for ocean disposal.

5.00 AFFECTED ENVIRONMENT. Port Canaveral was constructed on filled land and wetlands between the Atlantic shoreline and the Banana River as a Federal project first authorized in 1945 and expanded under congressional authorization in 1962. A barge canal, which serves the port, connects it with the Banana River and the Intracoastal Waterway by means of a lock that acts as a salinity control barrier. Entrance to the port is from Canaveral Bight via a dredged entrance channel and artificial cut through the barrier island to the port harbor and turning basins. The easternmost end of the port is devoted to military accommodations on its northern side and a public park and cruise ship docks on the south. Commercial structures including oil storage, cement transfer facilities, coal storage, general warehousing, and commercial fish processors occupy the central reach of the port. Fish houses and a marina border the southern boundary of the barge channel near the west basin. Extensive deepening and lengthening of the entrance channel to the port has been accomplished to serve the Trident submarine base.

5.01 Biological Resources. Wildlife present in the area include a wide variety of shore and sea birds, small mammals, reptiles, amphibians, and fishes. Birds such as pelicans, egrets, herons and gulls scavenge from picnickers and fishermen and use port and harbor structures for resting.

5.02 Terrestrial Vegetation. Most of the upland within the project area is on filled land with sparse vegetation consisting of annual pioneer species, shrubs, scrub plants, and Florida grasses. The vegetation includes Brazilian pepper, cabbage palm, scrub oak, saw palmetto, Australian pine, sandspur, prickly pear, wild lantana, coral-bean, sea purslane, stagger bush and similar species. No significant wildlife habitat is present.

5.03 Threatened and Endangered Species. The Corps of Engineers, in coordination with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, has identified the bald eagle, peregrine falcon, wood stork, manatee, and several species of sea turtles as possibly occurring in the project area. In addition, several species of whales may occur in the vicinity of the offshore disposal area, at least seasonally. Sea turtles utilize the beach north and south of the channel entrance for nesting during the summer months. There is no designated critical habitat in the project area.

5.04 Cultural Resources. The National Register of Historic Places does not list any sites within the project impact area. The nearest registered site is Launch Complex 39 at the Kennedy Space Center 14 miles to the north. The National Register of Natural Landmarks shows no designated landmarks within Brevard County, but consideration is being given to recommending the inclusion in the Register of the Cape Canaveral area because it is a geological formation that significantly illustrates geologic processes. Merritt Island National Wildlife Refuge, Kennedy Space Center, and various military installations are located north of the port. The State Historic Preservation Officer was consulted (see paragraph 6.07) and stated that no known sites would be affected (Appendix G, Pertinent Correspondence).

5.05 Recreation Resources. Two potential recreation sites exist within the Canaveral Harbor Project area. These include a park on the south side of the barge canal lock, on the far west end of the project; and a fishing walkway on the portion of the south jetty extending from the beach into the ocean (For a more detailed description, see Appendix A of the report).

5.06 Aesthetic Resources. Canaveral Harbor offers the traditional waterfront harbor scene in a subtropical setting. This includes a mix of water, sky, sun, and ships, with associated support facilities. The Southern sun and palm trees provide a particularly aesthetic vista. The view toward the Atlantic Ocean is low profile and in keeping with natural terrain features and is relatively unimpeded by manmade features.

6.00 Environmental Impacts. Implementation of the recommended action is expected to have insignificant adverse impacts in the port area and at the ocean disposal site. By letter dated September 16, 1989, the Corps requested Fish and Wildlife Service (FWS) comments on the considered alternatives pursuant to the Fish and Wildlife Coordination Act. By letter dated September 22, 1989, the FWS stated that the proposed action would have no significant long-term environmental effects on fish and wildlife resources (Appendix G, Pertinent Correspondence).

6.01 Material to Be Placed in the Ocean. A total of 26 core borings were drilled in Canaveral Harbor to identify the types and characteristics of the subsurface materials to be dredged (Appendix C of the Feasibility Report). Interbedded unconsolidated materials lie below the channel, the middle turning basin and within the channel widening area. The materials consist of silt, clay and some sand. No rock was encountered. In 1983 sediment sampled for maintenance dredging of the inner channel west of the middle turning basin was subjected to bioassay and bioaccumulation tests based on Federal guidelines published in the Environmental Protection Agency-Corps of Engineers Implementation Manual ("green book"). Sediment to be maintenance dredged from the middle turning basin was also tested in 1978. Results, summarized in the Section 103 Evaluation attached to this EIS, indicated that ocean disposal of the previously tested maintenance material would not result in adverse impact on water quality or marine organisms.

6.02 Chemical cargoes are not transported through Port Canaveral. Records kept by the Port Authority show that diesel fuel that was spilled occasionally in small quantities was in each instance confined and removed from the water. Based on all evidence of past testing of dredged material in the immediate project area and the nature of the proposed dredged material (virgin cut, not in direct exposure to contaminants), it is reasonable to conclude that the sediments will be acceptable for ocean disposal, and detailed testing is not appropriate nor necessary at this stage.

6.03 Additional testing of material to be dredged would be made prior to construction. This would ensure the availability of test data acquired within five years prior to construction.

6.04 Ocean Disposal Site. The existing ocean disposal site has been previously used on numerous occasions and is now designated for use on an interim basis. However, investigations have indicated that the site may be unable to accommodate projected volumes of dredged material proposed for ocean disposal. A candidate site, consisting of an area of 4 square nautical miles and enclosing the interim site, is proposed for designation as a permanent disposal site and publication of the final EIS for designation is expected in fiscal year 1990. Specific uses of the site are subject to evaluation and review in accordance with Section 103 of the Marine Protection Research and Sanctuaries Act (MPRSA). Impacts from use of the site are expected to be insignificant and short-term.

6.05 Threatened and Endangered Species. The proposed action has been coordinated with the U.S. Fish and Wildlife Service and the National Marine Fisherias Service under the Endangered Species Act. In a letter dated March 27, 1989 the FWS concurred with the Corps determination of no effect for listed species provided the construction precautions outlined in the Corps letter of March 14, 1989, are followed (see Appendix G Pertinent Correspondence).

6.06 In a letter dated September 29, 1989, the National Marine Fisheries Service (NMFS) also concurred with the Corps determination of no adverse impact for listed species under NMFS purview provided that the precautions listed for these species in the Corps letter of September 15, 1989, are followed (see Appendix G, Pertinent Correspondence).

6.07 Cultural Resources. The Corps coordinated proposed plans with the State Historic Preservation Officer (SHPO). The SHPO indicated there were no known sites in the area to be affected by the project and no potential for any significant sites there (letter dated October 16, 1987 Appendix G). Possible adverse effects to significant cultural resources were considered in accordance with the National Historic Preservation Act of 1966, as amended (PL 89-665); the Archeological and Historic Preservation Act, as amended (PL 93-291); and Executive Order 11593.

6.08 Recreation Facilities. The proposed recreation facilities at the Lock Park and Jetty Fishing Walkway would not involve significant adverse effects, only the minor, temporary impacts associated with construction. The recessed low-pressure sodium vapor lighting would be a safety measure as well as prevent disorientation of nesting sea turtles. The existing parking facilities and access roads are considered adequate to handle the increased usage expected with further recreation development.

6.09 Aesthetic Resources. An aesthetic evaluation of potential impacts of the proposed project was made to identify and assess existing resources and determine the impacts of proposed Corps activities. The proposed widening and deepening of the harbor will not adversely affect existing aesthetic resources. The recreation development under consideration is intended to increase the aesthetic experience in the harbor area. Moreover, safety features, which can often reduce the aesthetics of a planned environment, here create an inviting aesthetic response. The assessment was conducted in compliance with the Environmental Policy Act of 1966 (PL 91-190).

6.10 Water Quality. The work will be done with a clamshell dredge and the proposed action will meet all applicable State and Federal water quality standards during the time of construction.

6.11 Cumulative Impacts. Canaveral Harbor is a man-made channel that has been widened, deepened and maintained numerous times in the past. Since 1953, an average of 1,106,000 cy yards of material has been removed from Canaveral Harbor annually, including an estimated 249,000 cy in the summer of 1990. Of this amount, approximately 750,000 cy has been disposed of in the ocean annually, mostly in the existing interim site. It is estimated that future dredging and disposal will be in the same general range annually. Because the harbor is totally man-made and because of the frequency of dredging activities a stable marine environment has not developed in the harbor, and future dredging activities are expected to have little adverse impacts. Ocean disposal in the interim site appears also to have had minimal impacts, as much of the material placed in the site has gradually dispersed. A biological study conducted in 1986 in connection with investigations of the candidate site that would encompass the interim site indicated little difference in benthos from the site and from the surrounding area. Future disposal operations are thus expected to have little adverse environmental effects.

7.00 COORDINATION.

7.01 Scoping. The proposed action was coordinated with appropriate Federal, State, and local agencies and individuals in a scoping letter dated July 24, 1987. Responses were received from the U.S. Fish and Wildlife Service, the City of Cocoa beach, Florida DER and DNR, and the State Historic Preservation Officer, (SHPO) (see Appendix G, Pertinent Correspondence).

7.02 The FWS expressed concern that if wetlands in the Canaveral area were disturbed an impact on the wood stork would result. Under the recommended plan, disturbance of wetlands is avoided.

7.03 The Florida Department of Natural Resources requested that the Corps consider placement of sand on the beach, pursuant to Section 161.142, Florida Statutes, and that sediment core boring logs and grain size distribution analysis should be included in the EIS. The placement of sand is addressed in paragraph 4.06. The core boring logs and grain size analysis are in Appendix C.

7.04 The City of Cocoa Beach expressed concern about the project causing a loss of sand to area beaches. The proposed work will be confined to the inner portions of the harbor; there will be no impact to area beaches from the project.

7.05 The Florida Department of Environmental Regulation made two requests. The first was that sediments be analyzed for toxic constituents and other parameters. Testing is addressed in paragraphs 4.08, 6.01-6.03 and will be done prior to construction. The second request was that dissolved oxygen profiles should be provided for the existing channels and predicted DO profiles should be provided for each alternative. The Corps will do a dissolved oxygen profile prior to construction.

7.06 EIS Coordination. The Draft Report and EIS were coordinated with the appropriate Federal, State and local agencies and individuals. Responses to the EIS were received from the U.S. Department of the Interior, U.S. EPA, U.S. Air Force, U.S. Department of Housing and Urban Development and the State Clearing House, including comments from the State Department of Environmental Regulation, the Department of Natural Resources, Department of State and Department of Transportation (see Appendix G, Pertinent Correspondence).

7.07 The U.S. Department of the Interior expressed satisfaction with the EIS, noting that recessed low-pressure sodium vapor lighting on the fishing walkway would prevent disorientation of nesting sea turtles. The U.S. Environmental Protection Agency noted that the Corps should re-evaluate the suitabilty of the dredged material for disposal in the Canaveral Ocean Dredged Material Disposal Site. This will be done as noted in paragraphs 4.08 and 6.01-6.03 of the EIS. The EPA also requested that items a through h in the Section 103 Ocean Disposal Evaluation Report should be documented in brief summary form. The EIS and the Section 103 documents have been revised to reflect this concern. The U.S. Air Force noted that the project would not adversely affect Air Force operations, and the U.S. Department of Housing and Urban Development also stated that the project would have no impact on HUD programs.

7.08 The Florida State Clearinghouse stated that the project has been found to be consistent with the Florida Coastal Management Program but noted that the Corps is required to submit a consistency determination at each major point of decision-making for State review. This is consistent with Corps policy of close coordination with State agencies in planning, design, and construction of projects. The Florida Department of Environmental Regulation indicated the Draft EIS did not provide sufficient information on the status of the ODMDS, that impacts on sea turtles were not evaluated in the Feasibility Report, and that the dimensions of the project were not clear. The Feasibility Report and the FEIS have been revised to provide more information and clarification of these concerns. In regard to DER's concern over the projected excavation volume of the project and the Port Authority estimates, these are separate operations. The Port Authority plans are subject to the permitting process and are not a part of the authorized project. The Florida Department of Natural Resources expressed concerns on the need for a map on project core borings, on the need to provide the location and information concerning a proposed dike relocation, on the possibilty of beach quality sand occurring in the path of dredging, and expressed confusion over the location of the candidate Canaveral Harbor ODMDS. The Feasibility Report and FEIS have been revised to address these concerns. The Florida Department of State and the Department of Transportation both stated that they have no objections to the project as described in the Feasibility Report and EIS.

7.09 Other Coordination. The proposed action was coordinated with the FWS under the Fish and Wildlife Coordination Act by letter dated September 16, 1989. The FWS responded that the proposed action would have no significant long-term effects on fish and wildlife resources. It has also been coordinated with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service under the Endangered Species Act of 1973, as amended, and with the State Historic Preservation Officer. Both the USFWS and NMFS have concurred with the Corps' determination of no effect for listed species, provided that construction precautions outlined in the Corps' letters are followed. These precautions will be incorporated in the project plans and specifications.

8.00 LIST OF PREPARERS.

Name	Discipline	Experience	Contribution
Rea N. Boothby	Biology	17 years EIS Studies	EIS Author
Gerald L. Atmar, Ph.D.	Biology	17 years EIS Studies	EIS Supervisor
Rona Mazer, Ph.D.	Anthropology	6 years EIS Studies	Cultural, Recreation Studies
Eric Raasch	Economics	10 years Planning Studies	Economics Study
Management			
Jim McAdams	Environmental	10 years Planning	Water Quality Sediment Testing
Mark P. Wren	Technical Writer/Editor	22 years EIS Studies	Eis Editing

APPENDIX TO THE ENVIRONMENTAL IMPACT STATEMENT ON CANAVERAL HARBOR DEEPENING

SECTION 103 OCEAN DISPOSAL EVALUATION REPORT
CANAVERAL HARBOR NAVIGATION IMPROVEMENTS

1. Description of Action. The work would consist of removing approximately 1.0 million cubic yards of material with a mechanical bucket (clamshell) dredge, transporting it by barge and depositing it offshore in an Environmental Protection Agency-designated Ocean Dredged Material Disposal Site (ODMDS).

2. Description of Disposal Site. The candidate ODMDS is located with its western corner at 3 1/2 nautical miles due east of Cocoa Beach, Florida (figure 1) and is approximately 4.0 square nautical miles in size. Corner coordinates of the site are 28 20'08.63"N, 80 31'10.10"W; 28 18'52.93"N, 80 29'24.38W; 28 17'19.37"N, 80 30'49.90"W; and 28 18'35.05"N, 80 32'35.62"W (see figure 4).

3. Description of Material to Be Dredged. The material has a silt-clay content ranging from 6 to 98 percent.

4. Environmental Testing Results.

a. In August and December 1983, sediment to be maintenance dredged from the harbor was subjected to bioassay and bioaccumulation tests following Federal guidelines as published in the EPA/CE Implementation Manual ("green book"). The results summarized below indicate little potential for adverse environmental impacts resulting from ocean disposal of the material.

b. Liquid phase testing of a sediment sample taken in August 1983 indicate that none of the trace metals (Hg, Cd, An, As, Pb, Ni), PCB, or petroleum hydrocarbons would exceed EPA's quality criteria for marine waters.

c. Suspended phase testing in August 1983 resulted in mortality too low for calculation of an LC 50 for all organisms tested (Palaemonetes pugio, Mysidopsis bahia, and Menidia menidia).

d. Solid phase testing of a sediment sample within the project area was conducted in August 1983 using Mercenaria mercenaria, Nereis virins, and Paneaus azteca. Survival ranges of organisms exposed for 10 days to dredged material were 48 to 27 percent (brown shrimp), 79 to 82 percent (hard clams), and 81 to 92 percent (sandworms). Statistical analysis of total (combined) survival data for the three species indicate that total survival of organisms exposed to the solid phase of dredged material was not significantly less than total survival of organisms exposed to control material (69.3-82.3 percent versus 92.3 percent).

e. Even though the material technically passed this phase of testing, the entire solid phase test was repeated in December 1983 using composite samples. Survival ranges of organisms exposed for 10 days to dredged material was 86 to 98 percent (brown shrimp), 97 to 100 percent (hard clams), and 93 to 97 percent (sandworms). Analysis of total (combined) data for the three species indicate that total survival of organisms exposed to the solid phase of dredged material was not significantly less than total survival of organisms exposed to control material (92.7 to 95.7 percent versus 98 percent).

f. Concentrations of cadmium, mercury, and PCBs in all test organisms exposed to the solid phase of dredged material were not significantly higher (statistically) than concentrations in control organisms. Concentrations of aliphatic and aromatic petroleum hydrocarbons in brown shrimp and hard clams exposed to all samples of dredged material were not significantly higher (statistically) than concentrations in control organisms. Concentrations of aliphatic petroleum hydrocarbons in tissues of sandworms exposed to sample A ($x = 4.4$ ppb) of dredged material and concentrations of aromatic petroleum hydrocarbons in tissues of sandworms exposed to samples A and B ($x = 3.7$ ppb and 2.0 ppb respectively) of dredged material were significantly higher (statistically) than concentrations observed in organisms exposed to control sediment. However, the concentrations are so low that it is unlikely that there would be any adverse effect on the marine environment. In addition, these compounds do not biomagnify in the environment.

g. Chemical cargoes are not transported through Port Canaveral. Records kept by the Port Authority show that diesel fuel that was occasionally spilled in small quantities was in each instance confined and removed from the water. Based on all evidence of past testing of maintenance dredged material in the immediate project area and the nature of the proposed dredged material (virgin cut with no direct exposure to contaminants), it is reasonable to conclude that the sediments will be acceptable for ocean disposal, and detailed testing is not appropriate nor necessary at this stage. Confirmation of the suitability of the dredged material for ocean disposal will occur during detailed design and would include an appropriate level of testing.

5. Need for Ocean Disposal. There are insufficient upland sites that are economically justifiable or within an economical transporting distance of the project area to accommodate the dredged material, and the material is not suitable for beach nourishment.

6. Environmental Impacts of Ocean Disposal.

a. Aesthetics. The size and distance from shore of the disposal site eliminate adverse aesthetic impact as discussed in paragraph 6.09 of the EIS.

b. Recreation Resources. No significant impacts expected as described in paragraph 6.08 of the EIS.

c. Commercial Marine Resources. No significant impacts expected. There are no known commercially important marine resources in the general area of the disposal site.

d. Navigation. No significant impacts expected. The offshore site is not located in commercial shipping lanes.

e. Mineral Resources. No mineral resources will be affected as none are known to occur in the project area.

f. Cultural Resources. No significant adverse effects expected as discussed in paragraphs 5.04 and 6.07 of the EIS.

g. Water Quality. Some temporary adverse impact on water quality due to turbidity may occur at the disposal site, but overall, applicable water quality standards will be met. Elutriate tests and bioassays, if necessary, will be done prior to construction to confirm that there is no potential for undesirable effects on water quality due to the presence of contaminants in dredged material.

h. Threatened and Endangered Species. Sea turtles and whales may travel near the disposal site, at least seasonally. The National Marine Fisheries Service, in a letter dated September 29, 1989, listed precautions to be taken to prevent adverse impacts to listed species. The Corps will incorporate these precautions into plans and specifications for the project (see Appendix G, Pertinent Correspondence).

7. Determinations and Findings. The proposed ocean disposal will present:

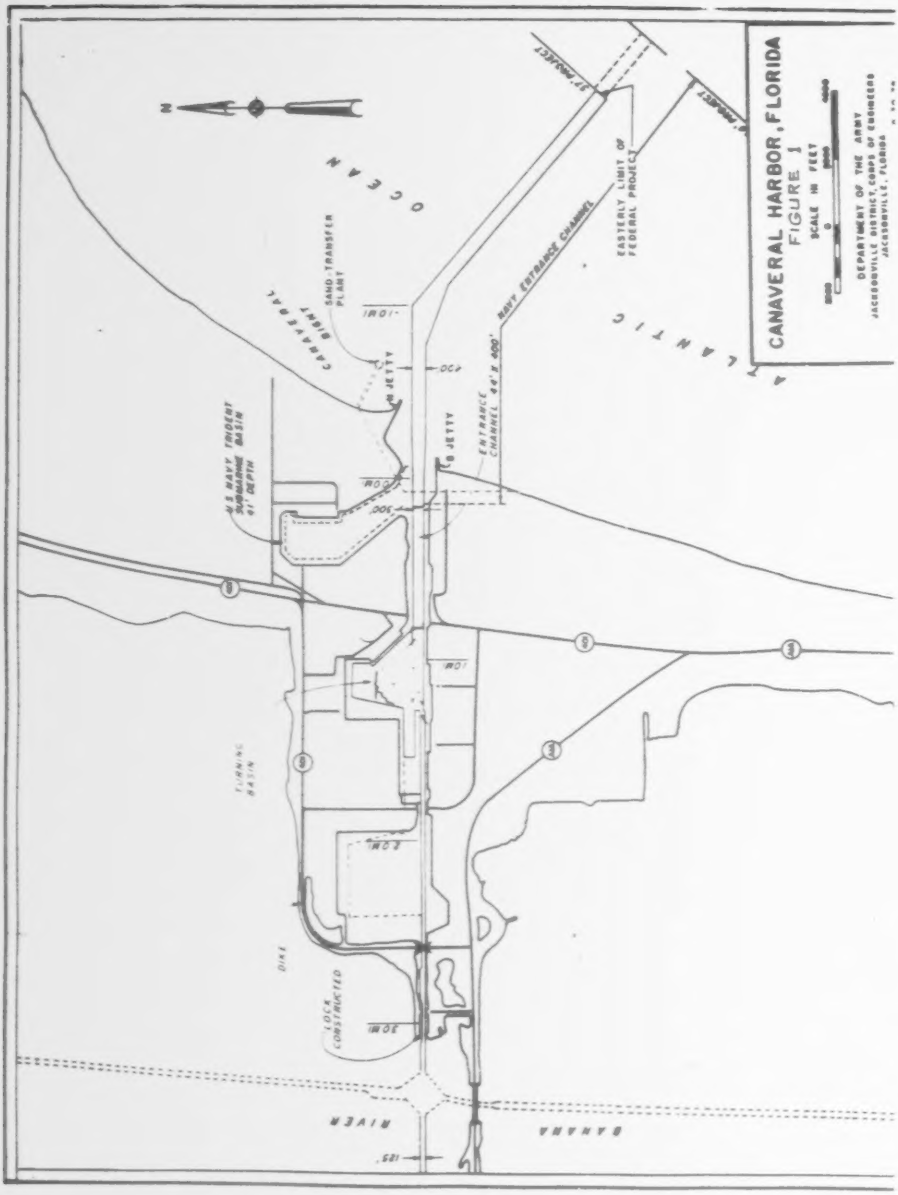
a. No unacceptable adverse effect on human health and no significant damage to the resources of the marine environment;

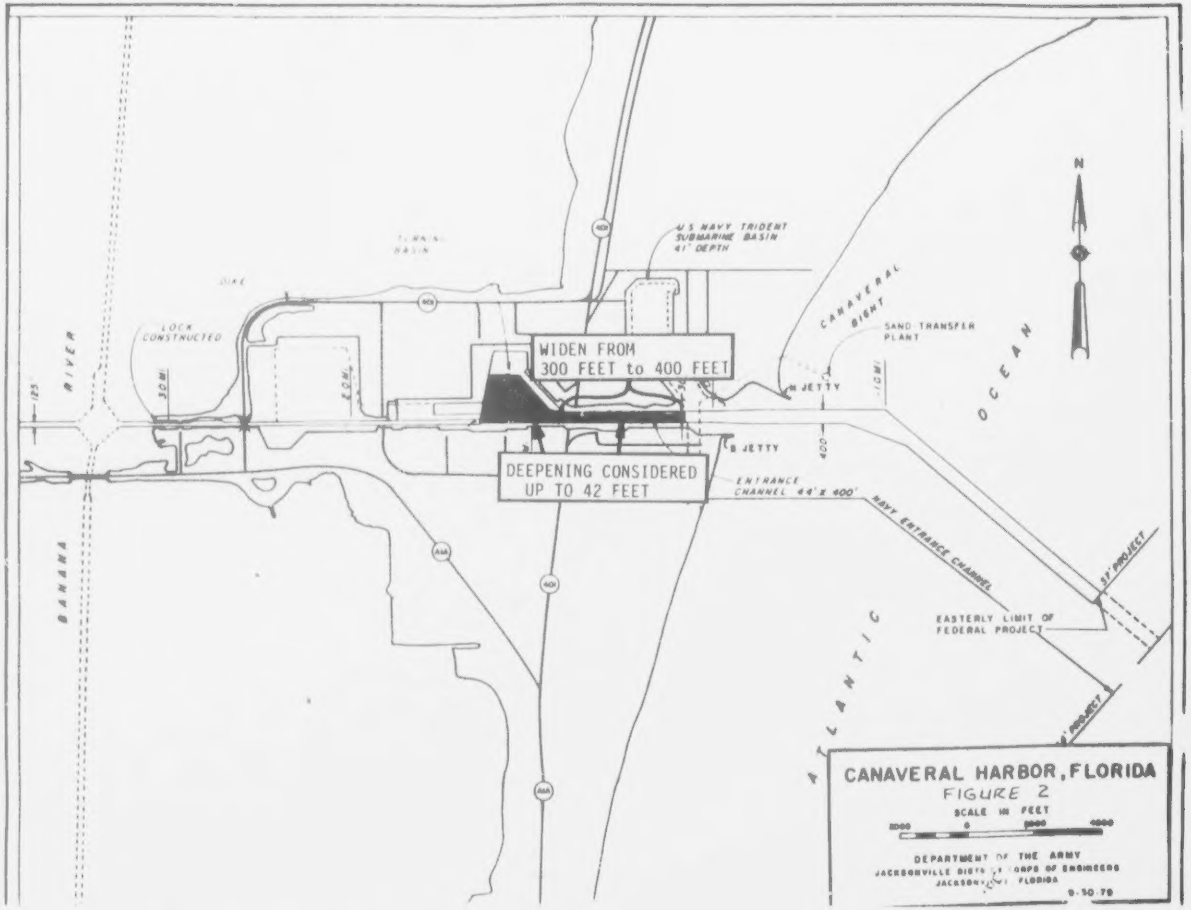
b. No unacceptable adverse effect on the marine ecosystem;

c. No unacceptable persistent or permanent adverse effects due to the dumping of projected volumes of these materials; and

d. No unacceptable adverse effect on the ocean for other uses.

The activity is in the overall public interest and should be implemented.

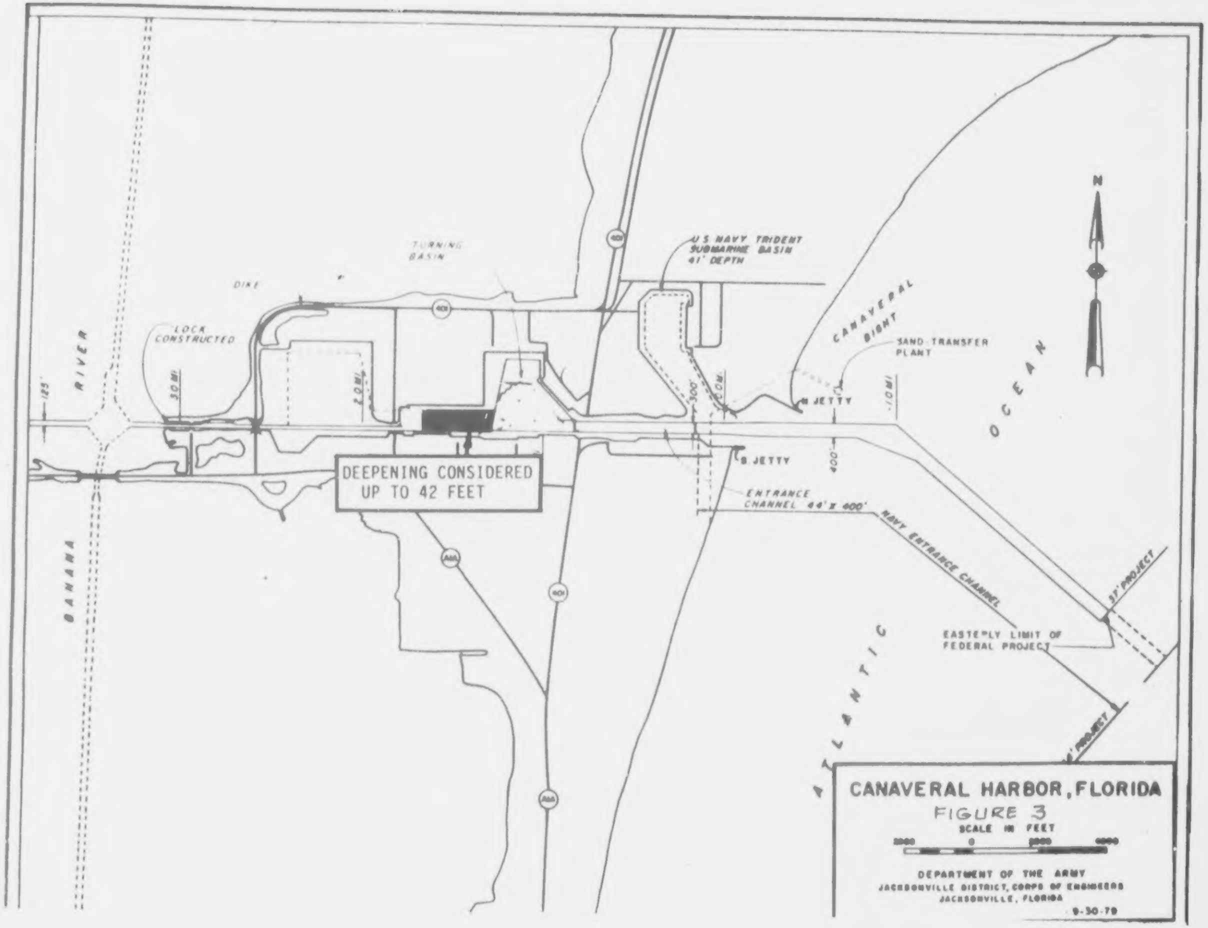

CANAVERAL HARBOR, FLORIDA
FIGURE 1
SCALE IN FEET
0
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
N
OCEAN
ATLANTIC
37' PROJECT
EASTERLY LIMIT OF FEDERAL PROJECT
NAVY ENTRANCE CHANNEL
SAND-TRANSFER PLANT
CANAVERAL BIGHT
N JETTY
S JETTY
ENTRANCE CHANNEL 44' X 400'
U.S. NAVY TRIDENT SUBMARINE BASIN 41' DEPTH
300'
TURNING BASIN
DIKE
LOCK CONSTRUCTED
BANANA
RIVER
125'



CANAVERAL HARBOR, FLORIDA

FIGURE 2

SCALE IN FEET
2000
0
2000
4000
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
9-30-78
N
WIDEN FROM
300 FEET to 400 FEET
DEEPENING CONSIDERED
UP TO 42 FEET
U S NAVY TRIDENT
SUBMARINE BASIN
41' DEPTH
CANAVERAL
BIGHT
SAND TRANSFER
PLANT
N JETTY
S JETTY
400
-10MI
OCEAN
ATLANTIC
ENTRANCE
CHANNEL 44' x 400'
NAVY ENTRANCE CHANNEL
37' PROJECT
PROJECT
EASTERLY LIMIT OF
FEDERAL PROJECT
TURNING
BASIN
DIKE
LOCK
CONSTRUCTED
30MI
20MI
125
RIVER
BANANA
401
A1A


N
OCEAN
ATLANTIC
CANAVERAL BIGHT
SAND-TRANSFER PLANT
N JETTY
S JETTY
.10MI
400'
.00MI
300'
ENTRANCE CHANNEL 44' x 400'
NAVY ENTRANCE CHANNEL
37' PROJECT
' PROJECT
EASTERLY LIMIT OF FEDERAL PROJECT
U.S NAVY TRIDENT SUBMARINE BASIN 41' DEPTH
TURNING BASIN
DIKE
LOCK CONSTRUCTED
2.0MI
3.0MI
125'
BANANA
RIVER
401
A1A
DEEPENING CONSIDERED
UP TO 42 FEET
SCALE IN FEET
2000
0
2000
4000

CANAVERAL HARBOR, FLORIDA

FIGURE 3

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

9-30-79

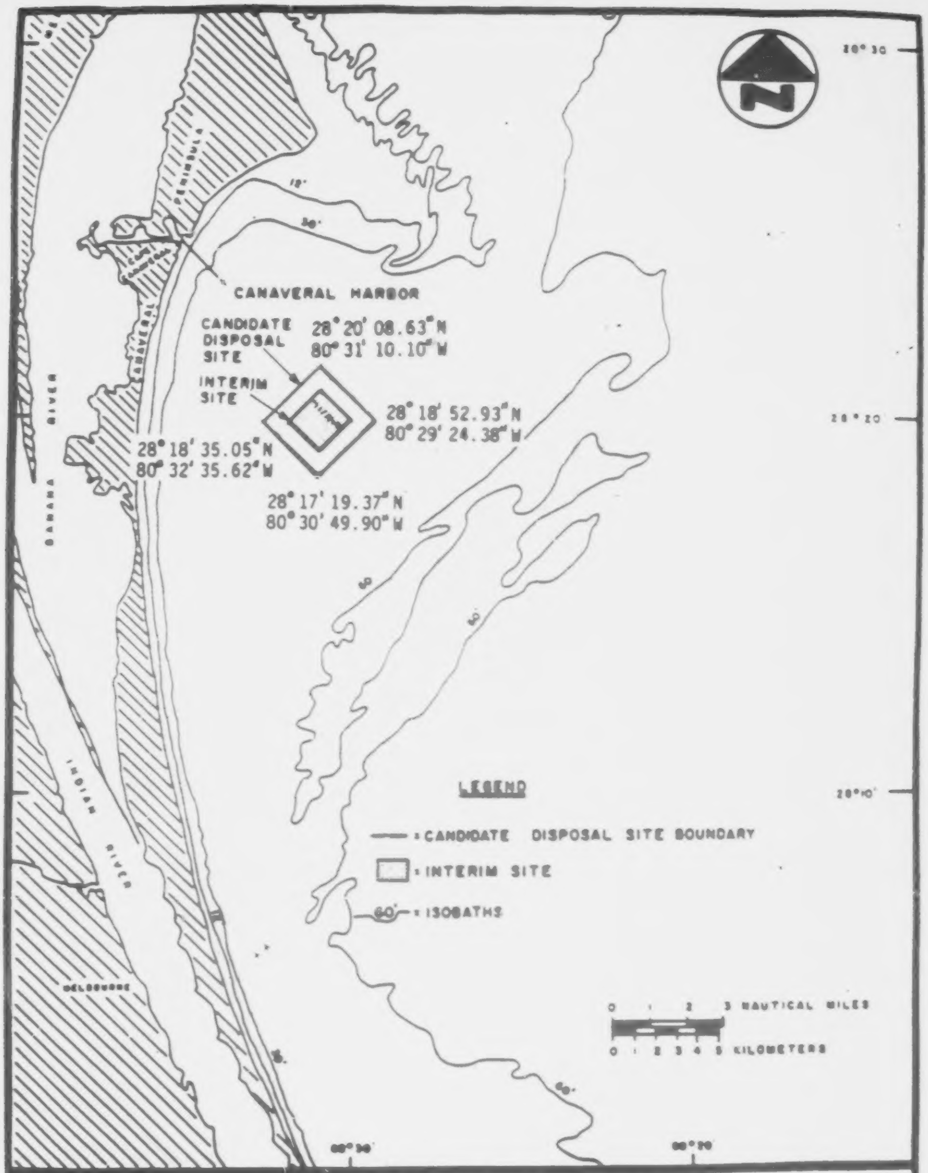

28° 30
28° 20
28°10'
80°30
80°20
CAPE CANAVERAL
CANAVERAL PENINSULA
BANANA RIVER
INDIAN RIVER
MELBOURNE
10'
30'
50'
60'
CANAVERAL HARBOR
CANDIDATE DISPOSAL SITE
28° 20' 08.63" N
80° 31' 10.10" W
INTERIM SITE
28° 18' 52.93" N
80° 29' 24.38" W
28° 18' 35.05" N
80° 32' 35.62" W
28° 17' 19.37" N
80° 30' 49.90" W
LEGEND
= CANDIDATE DISPOSAL SITE BOUNDARY
= INTERIM SITE
60' = ISOBATHS
0 1 2 3 NAUTICAL MILES
0 1 2 3 4 5 KILOMETERS

FIGURE 1. LOCATION OF THE CANDIDATE CANAVERAL HARBOR DISPOSAL SITE RELATIVE TO CANAVERAL HARBOR (ISOBATHS SHOWN IN FEET).

CANAVERAL HARBOR
FEASIBILITY STUDY

APPENDIX A - - RECREATION

1. INTRODUCTION By letters dated 17 January and 10 February 1989, the Canaveral Port Authority (C.P.A.) of Brevard County, Florida, requested that the "lock" park, consisting of a small day-use park just south of the existing barge canal lock, and a fishing walkway on the south ocean jetty, be included in the feasibility study for widening and deepening Canaveral Harbor. Subsequent coordination and study resulted in a recommended plan of recreation development with a total first cost of $921,000.

2. STUDY AUTHORITY Authority for the study is contained in resolutions adopted by the United States Senate and House of Representatives on 1 April 1969 and 11 December 1969, respectively, as follows:

"Resolved by the Committee on Public Works of the United States Senate, that the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby requested to review the report of the Chief of Engineers on Canaveral Harbor, Florida, published as Senate Document Numbered 140, Eighty-seventh Congress, with a view to determining whether the existing project should be modified in any way at the present time to accommodate present and prospective future commerce, both military and civilian."

"Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on Canaveral Harbor, Florida, published as Senate Document Numbered 140, Eighty-seventh Congress, with a view to determining whether the existing project should be modified in any way at the present time to accommodate present and prospective future commerce, both military and civilian."

3. RECREATIONAL DEVELOPMENT AUTHORITY Authority to consider Federal development of project-related recreational resources is contained in Section 4 of the 1944 Flood Control Act as amended by Sections 4, 209, and 207 of the Flood Control Acts of 1946, 1954, and 1962, respectively. Basic legislation is further affected by the Land and Water Conservation Fund Act (Public Law 88-578), the Federal Water Project Recreation Act (Public Law 89-72), and the Water Resources Development Act of 1986 (Public Law 99-662). The Corps' objective in terms of recreational development is to "fully consider the recreation potential that may be afforded a Corps Civil Works projects" (ER 1165-2-400).

The local sponsor pays 50% of the separable recreation first costs, provides lands, and assumes operation, maintenance, rehabilitation and replacement costs. Under current policy, the local share is to be financed during construction.

4. PROJECT DESCRIPTION The Canaveral Harbor project is located on the east coast of Florida, in Brevard County, just north of Cape Canaveral and Cocoa Beach, Florida. The 11.5 mile navigation project connects the Intracoastal Waterway (the Indian River) with the Atlantic Ocean. Prior work on the harbor, authorized in March 1945, includes a barge canal with a lock, a 37-foot entrance channel, a turning basin, and two rubblestone jetties at the harbor entrance. Feasibility study proposals consist of widening and deepening the harbor. In addition, the jetty will be extended 500 feet as proposed in the August 1989 GDM for the Canaveral Harbor Sand Bypass System.

5. LOCAL COOPERATION The Canaveral Port Authority (CPA) is the non-federal sponsor of a recreation plan to be implemented in conjunction with the harbor project. By letters dated 17 January 1989 and 10 February 1989, the CPA indicated its willingness to cost-share recreation planning and development and to assume subsequent operation and maintenance responsibilities. In the feasibility scope of study, the sponsor agreed that alternative development concepts would be assessed on the basis of cost and compatibility with harbor widening and deepening and that a cost to benefit analysis would be performed to determine Federal interest in the separable recreation component of the project. The sponsor worked closely with the Corps in the plan development, and proposals were reviewed in the field. (See Letter of Intent at the end of this appendix).

6. PROJECT-RELATED RECREATION RESOURCES As with many harbor projects, available lands eligible for cost-shared development are limited. However, two sites on the Canaveral Harbor project meet all federal criteria and present unique recreation opportunities integrally related to the project. The recommended plan consists of proposals for these two sites: a park on the south side of the barge canal lock, on the far west end of the Canaveral Harbor project; and, a fishing walkway on the portion of the south jetty extending from the beach into the ocean.

The site at the barge canal lock, known as Lock Park, currently consists of an open area without parking or other amenities (Photo 1). However, the lock itself, constructed as part of the Canaveral Harbor project, has a high interest value and potentially offers an educational opportunity. Views from the site are of the river and of a salt-shrub plant community that attracts many birds, including the Great Blue Heron and the endangered Wood Stork. The County maintains a small boatramp with facilities .3 miles directly east along the canal. Further east, there is a small recreational boat marina.

PHOTO 1 -- CANAVERAL HARBOR - LOCK PARK

PHOTO 2 -- CANAVERAL HARBOR - SOUTH JETTY

The ocean jetty site, known as Jetty Park, is located approximately two miles east of the Lock Park, at the harbor entrance on the Atlantic Ocean. It is a popular ocean beach park operated by the Brevard County Parks and Recreation Department. Current activities include R.V. and tent-camping, picnicking and swimming. The park provides parking, a small grocery store, snack bar, bait shop, laundry facilities, and restrooms. The south jetty is already popular as a local fishing spot, but the uneven jagged rocks are hazardous to anglers as shown in Photo 2. With the 500-foot extension of the south jetty, proposed for the federal sand bypass sytem, the attraction and danger to fishermen will be increased.

7. PROPOSED RECREATION FACILITIES The Lock Park improvement plan will provide picnic shelters, a playstructure, an open play area, a small dock for fishing, a lock observation tower with interpretive signs, a short boardwalk to a dock on an inner lagoon for nature observation, restrooms, and a parking lot. The area would be fenced to separate recreation activities from lock operations and would have a separate entrance for the public. (See Figure 1 at the end of this appendix).

Rather than competing with the existing activities at the Jetty Park, the proposed development at the Lock Park will offer an environmental education emphasis relative to the functioning of the lock on the barge canal and to the nearby marsh communities. It will provide an alternative for those visitors who aren't inclined to swim or camp on the beachfront, or to fish from the jetty. The objective in the development of this park is to utilize a scenic site that has not been managed for public recreation purposes until now.

The Jetty Park fishing walkway plan of improvement will modify approximately 1600 feet of the south jetty to include paving, a fish cleaning station, guardrail with recessed lighting, and an entrance deck interconnecting the walkway with existing recreation facilities. Modification of the south jetty for use as a fishing walkway will occur after construction of the sand transfer project in which the jetty will be extended by 500 feet. (See Figure 2 at the end of this appendix).

8. DESIGN CONSIDERATIONS

a. Handicap Access: All facilities will be designed in accordance with current regulations to permit use by the physically handicapped.

b. Vehicular Access and Parking Facilities: Access to the Lock Park will be via Mullet Road and access to the south jetty fishing walkway will be from Jetty Park Road, both of which are off North Atlantic Avenue at Bennett Memorial Causeway. Turfstone parking for 34 cars will be available at the Lock Park at project completion, along with overflow grassed-parking areas adjacent to the access road (now the current parking arrangement for the few visitors sightseeing). The existing Jetty Park parking area will serve the proposed jetty fishing walkway as well. Including the paved parking lot, the sand parking area along the channel, and the camper area, the parking capacity for the fishing walkway is approximately 1,000 cars.

c. Restrooms: A restroom will be provided at Lock Park approximately in the middle of the site and within easy distance of the handicap parking. The existing Jetty Park restroom facilities will serve the proposed jetty fishing walkway.

d. Power & Lighting: Existing power lines will be extended to serve all proposed facilities. Exterior lighting will be provided for safety.

e. Water Supply and Sanitary Facilities: Existing city water will be extended to serve both proposed facilities. A septic system is in place at the Lock Park west of the office; an adjacent system will be provided to accommodate the Lock Park restrooms.

Items Specific to the Lock Park Site

f. Play Structure: The play structure has been sized to accommodate approximately one school classroom (25-34 children) for field trips. The design has been chosen to reduce heat absorption and glare as much as possible for this climate. The combination of play events is carefully designed to offer a full complement of fitness skills for ages between 3 to 15 years, through slides, tunnels, arch climber, challenge ladder, swings, tire swing, steps, sliding pole.

g. Lookout Tower: The lookout tower has been situated to provide an excellent view of the lock activities down the length of the channel as well as for bird observation in three directions. The Lockmasters' current interpretive program will be relocated to the lock gate closest to the tower to take advantage of the views from the tower. This will be done by the local sponsor.

h. Docks: The two docks are located to provide passive nature observation points in two environmentally diverse areas: river and lagoon. Boardwalks are accessible by wheelchair and the docks are low enough to the water elevation to permit use of dip nets and contact with plants and water.

i. Grassed Open Play and Lock Maintenance Area: As noted on the proposed plan, this area suitable for frisbee and touch football for example, has also been designed to permit a clear open laydown area which can be temporarily fenced off approximately every six years for six months in order to perform lock gate maintenance. Cranes need a 24' minimum width between one set of trees for access. The contractor will be required to install temporary fencing without damage to trees, to regrass as needed, and to repair any damage to the portion of walkway within this area. Access to the lookout tower and the waterfront will be maintained during this period.

j. Irrigation: Irrigation will be provided throughout the park. Special design considerations will be given to the multiple-use grassed open area (see item i. above) to account for intermittent, but heavy-equipment use and material storage.

k. Bike Trail: A 5'-wide, asphalt bicycle trail extending 1650 feet along the canal will be incorporated into the plan to access the County-run boat ramp/mini-park on adjacent property to the east of the lock. This will provide an aesthetic connection for a biking public which already has a well-defined user group.

l. Landscape Design: Advantage can be taken of the unique plant material available for this subtropical climate. Several colorful, flowering shade trees are available which are hardy and adaptable to salt air conditions (which would not survive even 4 miles inland). The following are well suited to park conditions:

Latin Name	Common Name/Comments
Bauhinia blakeana	Hong Kong Orchid Tree, 50' rose fl.
Bauhinia variegata	Orchid Tree, 40' lavendar fl.,2" pods
Bursera simaruba	Gumbo Limbo, 60' decid. shiny bark
Coccoloba diversifolia	Pidgeon Plum, 70' white fl.
Cassia surattensis	Glaucous Cassia, to 25' yellow fl.
Plumeria alba	Frangipani, 35' decid., white fl.

Items Specific to the Jetty Walkway

l. Jetty Fishing Platforms and Fish Cleaning Stations: The platforms and cleaning stations have been located to avoid the expected shallow water (sand deposition) and/or conflict with beach swimming activities.

m. Entrance Deck: The entrance deck is designed to permit only pedestrian access to the fishing walkway. Safety bollards will prevent cars and cycles in this heavily-used area. Steps will connect the walkway's entrance deck to an existing boardwalk which leads to the concession and restrooms. A wheelchair access lane is located for access to the front of the concession.

n. Concrete steps with a landing have been provided, as a safety feature, to the northside "beach" which is only exposed during low tide. This area is currently only accessed by tedious, careful maneuvering down the jetty boulders. A clear warning sign located at the steps will be included to convey the need for caution nonetheless.

o. No trees or native shrubs will be removed to locate the access steps or handicap walkway.

p. Low-to-the-ground, recessed light fixtures have been chosen to avoid the possibility of disturbing endangered sea turtles as well as to reduce glare for those visitors who wish t view stars. Sodium vapor will be utilized since current scientific research concludes that turtles are repelled by this lighting type.

9. ENVIRONMENTAL IMPACT

a. Traffic patterns: With +/-1000 automobiles per day, the Jetty Park is expected to be able to absorb any additional traffic induced by the fishing walkway. The Brevard County Recreation Department is currently planning improved traffic circulation and parking within the site. The access roads to the Lock Park are well built and are adequate for increased useage; however, improved directional signage will be needed in order to avoid patron confusion and possible traffic-related consequences. The county is prepared to modify as needed.

b. Sea turtles: The presence of endangered sea turtles is well documented and has been accounted for in the preliminary design proposal. No beach nesting habitat is to be destroyed by implementation of the recreation plan. As noted earlier, care in the design of lighting on the jetty walkway will eliminate confusion for the mature sea turtles seeking beach nesting sites. After nesting, eggs are relocated to safer areas.

c. Safety: Given the high demand for saltwater, non-boat fishing in Florida, the portion of the south jetty extending seaward from shore has been designed to include a fishing walkway and guardrails. These facilities provide for the public safety and health and eliminate the current hazardous public use of the unimproved jetty directly adjacent to a county park (ref: ER 1130-2-439 of 12/87). Public safety and health measures at the Lock Park have been addressed to separate recreating patrons from potential lock maintenance activities and otherwise provide secure, hazard-free and handicap-accessible, recreation activities.

d. Aesthetics: The recreation plan of improvement at Port Canaveral, by its nature, is designed to increase the aesthetic experience in both parks, within the context of an intensive public-use area. Safety features, which can often reduce the aesthetics of a planned environment, here create an inviting aesthetic response.

10. LAND REQUIREMENTS The proposed recreation development is located on lands acquired for the Canaveral Harbor Project, and no separable lands for recreation purposes will be required. The seventy-five acres surrounding the lock, including the lock park

site and the levee on which the bicycle path is designed, are owned in fee title by the Federal government. The Canaveral Port Authority is the fee owner of the jetty land. However, the Federal government holds a perpetual easement on the jetty land and a right-of-way along the adjacent bank.

11. COST ESTIMATES Based on September 1989 price levels, the estimated costs of the recommended recreation plan are summarized in Tables 1 & 2 (one each for Lock Park and jetty walkway). These were discounted at 8 7/8 percent interest rate for a 50-year period to estimate average annual costs.

The total first cost of the recommended recreation plan is estimated at $950,000. The average annual cost of the plan is $141,530 including $36,000 for annual maintenance of the Lock Park and $20,000 for annual maintenance and periodic concrete replacement on the fishing walkway.

The Federal share of first costs would be 50% or $475,000. The local sponsor's share is an equivalent amount plus the subsequent operation and maintenance costs.

12. RECREATION DEMAND Recreation demand was determined using both quantitative and qualitative assessments. Presenting a quantitative demand-supply-needs analysis, the 1987 Florida Statewide Comprehensive Outdoor Recreation Plan (SCORP) identifies regional supply deficits in specific resource and facility units. When identified needs will be partially met by implementation of the recommended recreation plan, demand is assumed to exist. Since the SCORP's planning period, to 1995, is significantly shorter than the 50-year feasibility planning period to 2043, use of the SCORP assessment results in a conservative estimate for project planning. Therefore this plan does not reflect recreation requirements attributed to an expected population growth of 45 percent as forecast by OBERS through 2043. A qualitative view of demand was obtained through discussions with the Brevard County Parks and Recreation personnel. Their projections of park use are based on observed patterns at existing facilities and through traffic count analyses.

Proposed activities at the Lock Park include picnicking, sightseeing, and bicycling. Of these activities, the Florida SCORP projects a deficit of 465 miles of bicycle trails in 1995 within region VI, which includes Brevard County. There is no projected deficit for picnic tables or for sightseeing opportunities. However, given the current (1989) full capacity condition of Brevard County recreation facilities, it is estimated by the County that the Lock Park will receive a minimum of 300 patrons per day given its size and programmed amenities. On days when there are shuttle launches, the lock park is expected to have considerably greater utilization.

The jetty fishing walkway primarily provides an opportunity for saltwater fishing (non-boat). Heavy demand for this activity throughout the state is documented in the 1987 SCORP. Within SCORP region VI, the 1985 demand for saltwater fishing (non-boat) exceeded supply, resulting in a deficit of facilities for up to 1,026 persons per weekend day, or 5,133 linear feet of fishing access. Projections to 1995 increase the deficit to 16,493 linear feet of fishing access. This six-county deficit in region VI can be met only in the two coastal counties of Volusia and Brevard.

The current rate of usage at Jetty Park has been documented by traffic count to be approximately 1,960 per day (August 1989). Of those, approximately 150 people are currently using the jetty for fishing regardless of the difficult access and unsafe situation. The County Recreation Department estimates that at minimum, double that number of people would use an easy-access, safe fishing walkway. All recreation facilities in the county are currently well to overused by tourist demand. The County has acquired an additional 200' of beach front (15 acres) at Jetty Park which will be developed for public use by the time this proposed fishing walkway would be complete, further increasing the expected walkway use.

The Fernandina Beach State Park was used for comparison as it provides comparable major tourist/local recreation facilities, including a 1500 foot lighted fishing pier at the entrance to the Cumberland Sound (St. Marys River at the Florida/Georgia border).

It has a documented usage rate of approximately 20,000 per month. It is estimated that between one third and one half of park users are actively using the fishing pier, or about 276 per day.

13. BENEFIT ESTIMATE For the purposes of benefit estimation the capacity method was used to determine the annual recreation days that would be expected at the proposed Lock Park and jetty fishing walkway. These closely compared with use estimates provided by the County. (See section on Recreation Demand). At both sites, instantaneous capacity factors, daily turnover rates, and weekend versus weekday recreation patterns were used to determine the expected annual visitation. In this region of Florida, there is no seasonality to recreation participation.

Annual use of the Lock Park was estimated at 41,600 recreation days at the beginning of the planning period. Growth from this 66 percent capacity to full capacity or 62,400 recreation days, was assumed over the project's 50-year life.

Annual use of the jetty fishing walkway was calculated as a combination of existing use (base condition) and increased use related to proposed walkway construction. At the beginning of the planning period, annual use was estimated at 62,400 recreation days, where half represents a marginal increase over the base condition. Growth to 86,800 recreation days, or full capacity, was assumed over the project's 50-year life.

A unit-day value was assigned to the recreation experience at the Lock Park and at the jetty fishing walkway (with and without walkway installation). These values, based on characteristics of the proposed facilities, competitive facilities within the market area, carrying capacities, accessibility and the potential environmental experience, are summarized in Tables 3a, 3b and 3c.

Average annual equivalent benefits for the Lock Park are estimated at $201,852 on the basis of a $4.35 unit-day value. Average annual equivalent benefits for the jetty fishing walkway are estimated at $237,774 on the basis of a $5.10 unit-day value

TABLE 3a

RECREATION POINT VALUES FOR UNIT-DAY VALUE ANALYSIS
(ER 1105-2-40)
LOCK PARK, Canaveral Harbor, FL

CRITERIA/JUDGEMENT FACTORS	POINT VALUES with project	without
a. recreation experience: boardwalk to lagoon; ecosystem; picnicking, bicycling, dock on open river.	18	0
b. availability of opportunity: relatively unique environmental educational opportunity of locks. Not available within 2 hours.	15	0
c. carrying capacity: adequate facilities; adjusted to reflect possible overuse at times of shuttle launches.	7	0
d. accessibility: access roads are good, though not currently well-marked.	7	0
e. environmental quality: high aesthetic value with river, native vegetation enhanced by wildlife; needs trees for climate control; possible noise from intracoastal highway bridge.	11	0
Lock Park TOTAL POINTS	58	0

TABLE 3b

RECREATION POINT VALUES FOR UNIT-DAY VALUE ANALYSIS
(ER 1105-2-40)
JETTY FISHING WALKWAY, Canaveral Harbor, FL

CRITERIA/JUDGEMENT FACTORS	POINT VALUES	
	with project	without
a. recreation experience: high quality activities: 1) 1638' lighted fishing walkway, 2) enhanced beachfront; gen. activities: swimming, camping	20	12
b. availability of opportunity: no high quality fishing walkway within miles.	15	8
c. carrying capacity: optimum facilities development, enhances associated activities on site.	11	0
d. accessibility: roads are good. Need improved identification location markers (signs, trees etc) to major highway access point.	11	0
e. environmental quality: above average aesthetic quality somewhat reduced by unregulated parking; to be rectified by County.	8	3
	===	===
Jetty walkway TOTAL POINTS	65	23

TABLE 3c

CONVERSION OF POINT RATING SYSTEM TO DOLLAR VALUES
Canaveral Harbor, FL

ACTIVITY CATEGORY	POINT VALUES*	FY89 DOLLAR VALUES
General Recreation		
-Lock Park	58	$4.35
General Fishing & Hunt.		
-Jetty walkway, with	65	5.10
without project	23	3.50

*from Table 3a,3b

for the with-project condition and a net differential of $1.60 from the base condition which is given a value of $3.50.

Total combined average annual equivalent benefits for the proposed recreation plan were estimated at $439,626.

14. BENEFIT TO COST RATIO The B/C ratio for the proposed Port Canaveral recreation plan was estimated at 3.1/1.

15. CONCLUSIONS AND RECOMMENDATIONS Approval of the recreation development proposal is recommended. The addition of recreation would provide additional recreation opportunities on the Canaveral Harbor project and address lack of utilization of recreation resources at the Lock Park. It would specifically eliminate obvious safety concerns at the south jetty.

Upon approval of the plan and execution of the Local Cooperation Agreement to include the recreation component, the Feature Design Memorandum will be prepared and submitted for approval prior to preparation of contract documents.

SEPTEMBER, 1989 PRICE LEVEL

CANAVERAL HARBOR RECREATION FACILITIES
FEASIBILITY STUDY
Jetty Fishing Walkway

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY (In acct. 14.0.Z.-)	TOTAL PROJECT COST
14.-.-.-	RECREATION FACILITIES Jetty Fishing Walkway							
14.0.A.-	Mobilization & Demobilization	1	JOB	LS	25,000	12	3,000	28,000
14.0.3.-	Activity Guides and Controls							
14.0.3.B	P.C. Concrete Posts 10" x 10"	256	EA	50.00	12,800	20	2,560	15,360
14.0.3.B	Cable between Posts	6,700	LF	2.50	16,750	12	2,010	18,760
14.0.P.-	Concrete							
14.0.P.C	Chinking Stone	475	TON	87.00	41,325	30	12,398	53,723
14.0.P.C	Concrete	1,911	CY	86.00	164,346	12	19,722	184,068
14.0.P.C	Concrete Steps with Aluminum Handrail	1	EA	1,600	1,600	20	320	1,920
14.0.P.C	Conc. Steps w/ Al. Hand., Ramp & Platform	1	JOB	LS	6,300	20	1,260	7,560
14.0.P.C	Bollards	84	EA	525.00	44,100	20	8,820	52,920
14.0.P.C	Fish Cleaning Table w/ Sink & Light above	1	JOB	LS	800	12	96	896
14.0.6.-	Utilities							
14.0.6.Q	Water Service to Fish Cleaning Table	1	JOB	LS	4,000	30	1,200	5,200
14.0.6.R	Elec. Serv. to Bollards & F. Clean. Table	1	JOB	LS	13,500	30	4,050	17,550
	Subtotal, Construction Costs:				$331,000			
14.0.Z.-	Contingencies @ average of 16.6%						$55,000	
14.-.-.-	Recreation Facilities Total:							$386,000
30.-.-.-	PLANNING, ENGINEERING AND DESIGN				26,000		4,000	30,000
31.-.-.-	CONSTRUCTION MANAGEMENT				23,000		4,000	27,000
	TOTAL PROJECT COSTS				$380,000		$63,000	$443,000

SEPTEMBER, 1989 PRICE LEVEL

CANAVERAL HARBOR RECREATION FACILITIES
FEASIBILITY STUDY
Canaveral Harbor Lock Park

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY (in acct. 14.0.Z.-)	TOTAL PROJECT COST
14.-.-.-	RECREATION FACILITIES Canaveral Harbor Lock Park							
14.0.C.-	Permanent Access Roads and Parking:							
14.0.C.B	Asphalt Pavement	779	SY	26.25	20,449	12	2,454	22,903
14.0.C.B	Concrete Curb	440	LF	9.30	4,092	12	491	4,583
14.0.C.B	Turf Stone	586	SY	24.50	14,357	12	1,723	16,080
14.0.1.-	Parking Lots and Service Roads:							
14.0.1.B	Concrete Wheel Stops	34	EA	26.75	910	12	109	1,019
14.0.2.-	Site Grading and Landscaping:							
14.0.2.B	Entrance Sign	2	EA	1,200	2,400	25	600	3,000
14.0.2.B	Interpretive Sign	1	EA	500	500	25	125	625
14.0.2.B	Trail Signs	5	EA	125	625	12	75	7[illegible]
14.0.2.B	Landscaping	1	JOB	LS	21,900	20	4,380	26,[illegible]
14.0.2.Q	Irrigation	1	JOB	LS	17,000	30	5,100	22,100
14.0.3.-	Activity Guides and Controls:							
14.0.3.B	Pavers Interlock	200	SF	35.00	7,000	12	840	7,840
14.0.3.B	Remove Chain Link Fence	100	LF	3.50	350	25	88	438
14.0.3.B	Foot Trails (Crushed Stone) 6' wide	854	LF	12.45	10,632	12	1,276	11,908
14.0.3.B	Entry Fence	2	EA	1,600	3,200	12	384	3,584
14.0.3.B	Gate 12' (Entrance)	2	EA	1,400	2,800	25	700	3,500
14.0.3.B	Wood Fence	570	LF	28.00	15,960	20	3,192	19,152
14.0.3.B	Edging for Foot Trail	1,708	LF	1.10	1,879	15	282	2,161
14.0.3.B	Bollards	6	EA	500.00	3,000	20	600	3,600
14.0.3.F	Boardwalks	133	LF	140.00	18,620	20	3,724	22,344
14.0.4.-	Day Use Areas:							
14.0.4.B	Grill (Individual Shelter)	12	EA	115.00	1,380	12	166	1,546
14.0.4.B	Grill (Group)	6	EA	300.00	1,800	12	216	2,016
14.0.4.B	Play Structure	1	EA	14,000	14,000	12	1,680	15,680
14.0.4.B	Picnic Tables	18	EA	190.00	3,420	12	410	3,830
14.0.4.B	Benches for Tables	36	EA	275.00	9,900	12	1,188	11,088
14.0.4.B	Timber Edging	200	LF	3.00	600	12	72	672
14.0.4.B	Sand 6" (Playground)	46	CY	15.00	690	12	83	773
14.0.4.F	Group Shelter (600 sf each)	2	EA	18,600	37,200	12	4,464	41,664
14.0.4.F	Individual Shelter	6	EA	1,400	8,400	12	1,008	9,408

CANAVERAL HARBOR RECREATION FACILITIES
FEASIBILITY STUDY
Canaveral Harbor Lock Park

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY (In acct. 14.0.Z.-)	TOTAL PROJECT COST
14.-.-.-	RECREATION FACILITIES Canaveral Harbor Lock Park							
14.0.6.-	Utilities							
14.0.6.B	Wastewater	1	JOB	LS	8,700	20	1,740	10,440
14.0.6.B	Water (Well)	1	EA	1,300	1,300	30	390	1,690
14.0.6.B	Storm Sewer	1	JOB	LS	37,500	20	7,500	45,000
14.0.6.B	Reroute Electrical & Telephone	1	JOB	LS	1,200	30	360	1,560
14.0.6.R	Electrical Work	1	JOB	LS	32,800	20	6,560	39,360
14.0.P.-	Utilities							
14.0.P.-	Restroom (575 sf)	1	EA	47,200	47,200	20	9,440	56,640
14.0.P.-	Bench (Park)	3	EA	330.00	990	12	119	1,109
14.0.P.-	Water Fountain	1	EA	800.00	800	12	96	896
14.0.R.-	Utilities							
14.0.R.B	Trash Receptacles	10	EA	90.00	900	12	108	1,008
	Subtotal, Construction Costs:				$354,000			
14.0.Z.-	Contingencies @ average of 17.5%						$62,000	
14.-.-.-	Recreation Facilities Total:							$416,000
30.-.-.-	PLANNING, ENGINEERING AND DESIGN				28,000		5,000	33,000
31.-.-.-	CONSTRUCTION MANAGEMENT				25,000		4,000	29,000
	TOTAL PROJECT COSTS				$407,000		$71,000	$478,000

PORT CANAVERAL &
FOREIGN TRADE ZONE 136
CANAVERAL PORT AUTHORITY • P O BOX 267 • CAPE CANAVERAL FL 32920
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17 January 1989

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U. S. Army Corps of Engineers
P. O. Box 4970
Jacksonville, Florida 32232-0019

Subj: Feasibility study for widening and deepening the Canaveral Harbor

Encl. 1: Gee & Jenson drawing "Lock Park" dated 2-20-86

Dear Mr. Salem:

As previously discussed, it is requested that the development of Lock Park as shown on Encl. (1) be included in the subject feasibility study report.

This constitutes a Letter of Intent whereby the Canaveral Port Authority agrees to pay 50% of the design and construction costs for the recreational facility at Lock Park and further agrees to assume operation and maintenance responsibility for the completed recreational facility.

Sincerely,
CANAVERAL PORT AUTHORITY

Joseph Lapolla
Deputy Executive Director

JL:wm

cc: John Lauwaert, COE
Marvin Bailey, COE

PORT CANAVERAL &
FOREIGN TRADE ZONE 136
CANAVERAL PORT AUTHORITY • P.O. BOX 267 • CAPE CANAVERAL, FL 32920
40 783 7831 • TELEX 981573 (ANS. BK.) PT CANAVERAL • FAX 407 784-6223

10 February 1989

Mr. A. J. Salem
Chief, Planning Division
U. S. Army Corps of Engineers
P. O. Box 4970
Jacksonville, Florida 32232-0019

Subj: Feasibility study for widening and deepening the Canaveral Harbor

Ref. A: My letter to you dated 17 January 1989

Dear Mr. Salem:

As previously discussed, it is requested that the south jetty, after extension by 500 ft by the sand transfer project, be paved, lighted, and have appropriate guardrails for use as a recreational fishing pier. The estimated cost of this recreational project is approximately $500,000 and it is requested that it be included in the subject feasibility study report.

This constitutes a Letter of Intent whereby the Canaveral Port Authority agrees to pay 50% of the design and construction costs of the paving, lighting and guardrail system for the south jetty including its extension and development of a recreational fishing pier.

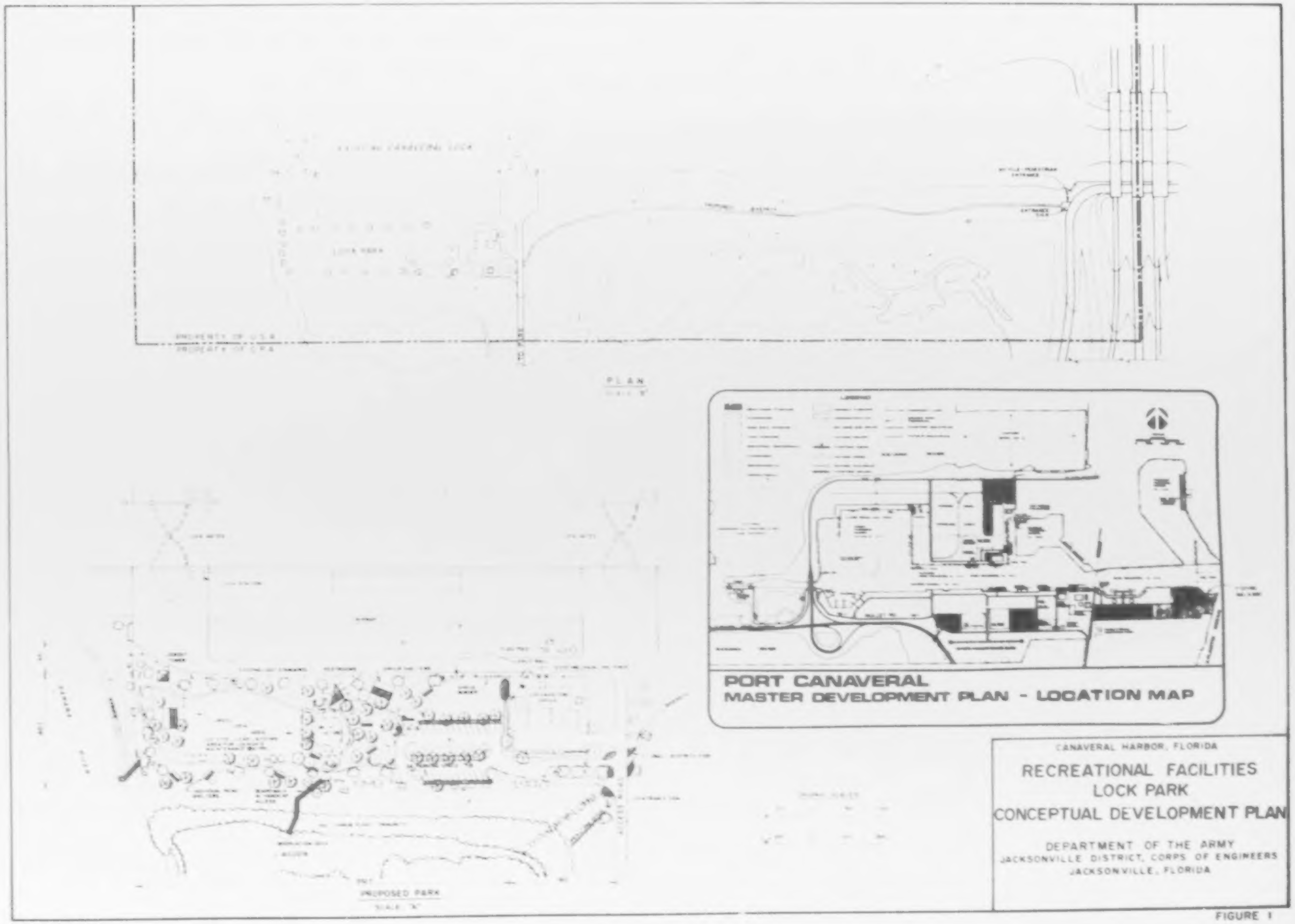
Your cooperation in this regard is greatly appreciated.

Sincerely,
CANAVERAL PORT AUTHORITY

Joseph Lapolla
Deputy Executive Director

JL:wm

cc: John Lauwaert, COE
Marvin Bailey, COE

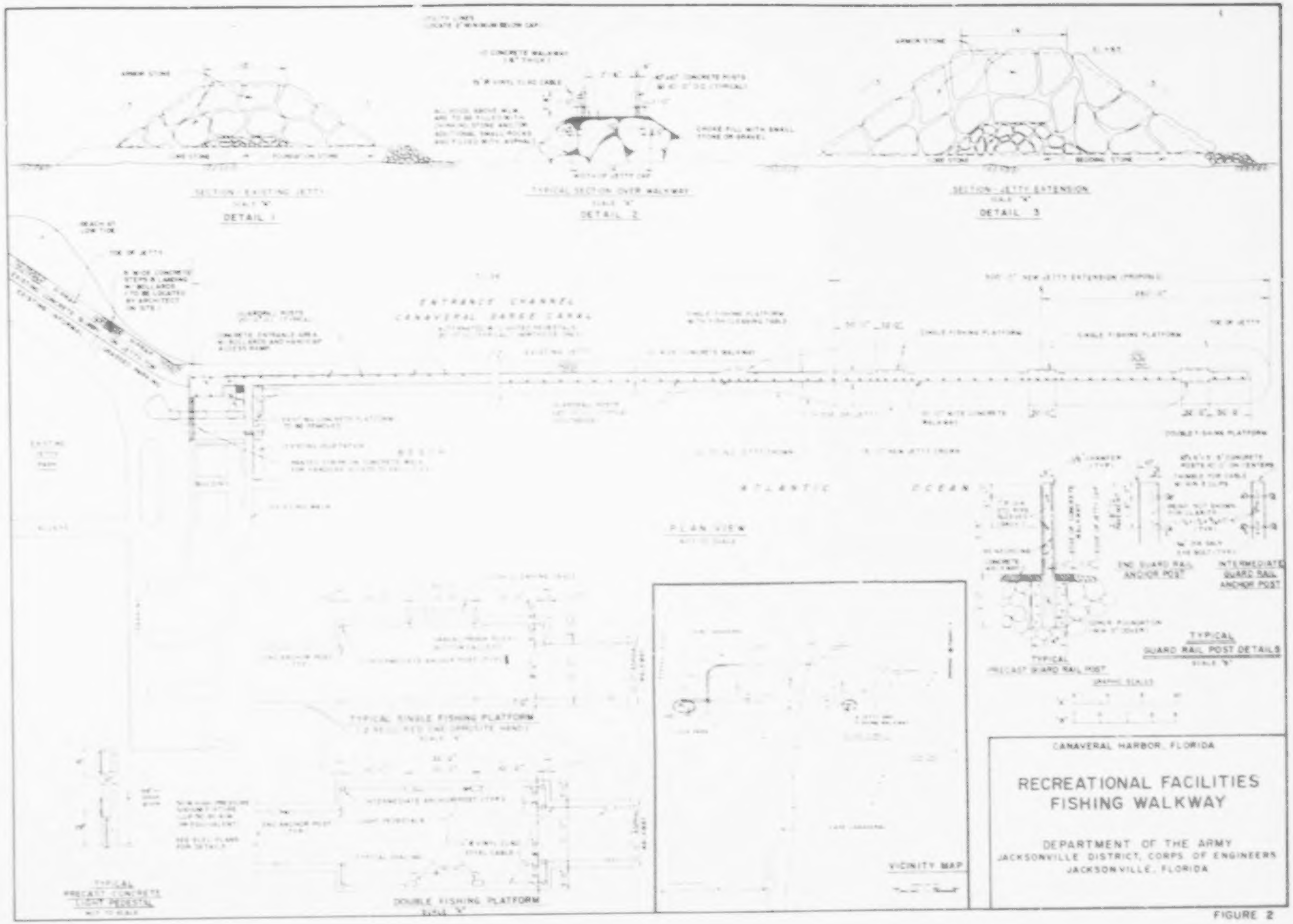

EXISTING CANAVERAL LOCK
LOCK PARK
PROPERTY OF U.S.A.
PROPERTY OF C.P.A.
BICYCLE - PEDESTRIAN ENTRANCE
ENTRANCE SIGN
PLAN
SCALE "B"
PROPOSED PARK
SCALE "A"
PORT CANAVERAL
MASTER DEVELOPMENT PLAN - LOCATION MAP
LEGEND

CANAVERAL HARBOR, FLORIDA

RECREATIONAL FACILITIES
LOCK PARK
CONCEPTUAL DEVELOPMENT PLAN

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

FIGURE 1


SECTION - EXISTING JETTY
SCALE "A"
DETAIL 1
TYPICAL SECTION OVER WALKWAY
SCALE "A"
DETAIL 2
CHOKE FILL WITH SMALL STONE OR GRAVEL
SECTION - JETTY EXTENSION
SCALE "A"
DETAIL 3
ARMOR STONE
ENTRANCE CHANNEL
CANAVERAL BARGE CANAL
SINGLE FISHING PLATFORM
DOUBLE FISHING PLATFORM
ATLANTIC OCEAN
PLAN VIEW
END GUARD RAIL ANCHOR POST
INTERMEDIATE GUARD RAIL ANCHOR POST
TYPICAL PRECAST GUARD RAIL POST
TYPICAL GUARD RAIL POST DETAILS
SCALE "B"
GRAPHIC SCALES
TYPICAL SINGLE FISHING PLATFORM
DOUBLE FISHING PLATFORM
SCALE "B"
TYPICAL PRECAST CONCRETE LIGHT PEDESTAL
VICINITY MAP

CANAVERAL HARBOR, FLORIDA

RECREATIONAL FACILITIES
FISHING WALKWAY

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

FIGURE 2

APPENDIX B

ENGINEERING, DESIGN, AND COST ESTIMATING FOR NAVIGATION FEATURES

Engineer Manual EM 1110-2-1613, "Hydraulic Design of Deep Draft Navigation Projects" (the EM), and Engineer Regulation ER 1110-2-1404, "Deep Draft Navigation Project Design" (the ER), were used in the planning, engineering, design, and cost estimating for Canaveral Harbor. Those documents provide the basis for what the professional engineer uses in planning and designing our Nation's deep draft waterways.

The plans developed in this report explored the opportunities associated with various deepening and widening alternatives. All plans used the same widths and horizontal dimensions except for those in the inner reach of the entrance channel. Since the plans are essentially the same, this appendix only discusses the selected plan.

THE SELECTED PLAN

The selected plan consists of deepening and widening the existing Civil Works navigation project at Canaveral Harbor. The existing civil works navigation project provides for a 35-foot and a 31-foot project. The Federal civil works features consist of: an entrance channel, 37′ X 400′ in the outer reach and 36′ X 300′ in the inner reach (shown on plate B-1); a 35-foot main turning basin; and a 31-foot West Turning Basin and Access Channel. The 31-foot portion of the West Access Channel and Turning Basin have been deepened to 35 feet by local interests. In addition to the Civil Works project at Canaveral Harbor, the U.S. Navy has constructed a 41-foot project to service their facilities near the jettied entrance to the harbor. The 41-foot Navy project includes a 44′ X 400′ channel in the outer reach of the entrance channel

In accordance with Federal policy, that portion of the Navy project that is superimposed on the Civil Works project is operated and maintained as a Civil Works project. This means that outer reach of the entrance channel, landward of the 37-foot contour, is operated and maintained as a Civil Works project. Moreover, the Seaward reaches of the outer reach beyond the 37-foot contour and the Trident Basin are operated and maintained as a U.S. Navy Project.

The selected plan calls for deepening the existing 35-foot civil works project to 39 feet and deepening the first 1800′ of the West Access Channel to 39 feet. The selected plan consists of extending the civil works depth to 41 feet in the outer reach over a bottom width of 400 feet, deepening the inner reach to 40 feet and widening 400 feet (increasing the width 50 feet to the north and 50 feet to the south), deepening a 1,200′ diameter portion of the Main Turning Basin to 39 feet, and deepening the first 1,800′ of the West Access Channel to 39 feet. The plan will be constructed along the existing centerlines, except for about 1000 feet on the western end of the inner reach, which involves a transition of the channel centerline 50 feet to the north, as shown on plate B-2. In addition to the general navigation features, each navigation channel includes 1-foot of advanced maintenance overdepth dredging. The existing and selected project dimensions are displayed in the following.

Project Feature	Existing Federal Dimensions	Recommended Dimensions
U.S. Navy		
Entrance Channel	44' X 400'	44' X 400'
Civil Works		
Entrance Channel	37' X 400'	41' X 400'
Inner Channel	36' X 300'	40' X 400'
Middle Turning Basin	35' X Irregular Shape	39' X 1,200' Diameter, Remainder 35'
West Access Channel Cut A		
Sta 0+00-18+00	31' X 400'	39' X 400'

PROJECT DEPTHS

Depth is one of two main elements in the design of a channel. In evaluating depth, wave conditions, as well as transiting vessels' draft, were primary factors in the analysis. As stated earlier, the project depth for the selected plan is 39 feet below the mean low water datum. In addition to that depth, additional depth allowances are needed to construct, operate, and maintain the project. Those other depths are comprised of dredging tolerances and advanced maintenance. As the new work materials are primarily silt and clay with some sand, contact with the bottom is not as critical as with rock which was not encountered during subsurface investigations.

WAVE CLIMATE

The wave climate along the entrance channel does have conditions that require additional safety allowances for vessel roll, pitch, and heave actions. The existing Federal Civil Works project uses 2 feet for this type safety allowance in the Entrance Channel and 1 foot in the Inner Channel. Those depths are part of the selected plan.

ADVANCED MAINTENANCE

The selected plan will also require some additional depth for advanced maintenance purposes in all but the extended civil works entrance channel. Those considerations are discussed in latter paragraphs on project operation and maintenance.

TIDAL INFLUENCES

The mean tidal range for the interior channel is 3 feet. One foot of that depth is usually available most of the time. However, the impact of tides on vessel operations at Canaveral Harbor is minor. The greater depth available using tidal advantaage is not a significant factor for the vast majority of vessels calling at the port. This is evident from the small number of vessels loaded to drafts over 33 feet on 27 vessels in 1988.

A number of factor have been identified which act to minimize the use of tidal advantage. These include the narrow range of tidal variation, which increases the likelihood of tidal delays and aversion to delays by vessel operators, particularly those currently engaged in two-port discharges of cargo. These factor contribute to the decisiion by vessel operators to minimize tidal delays. The loaded drafts of vessels reflect the policies of the shipping lines. Those policies are shaped by the demands of the market for transportation services. The shipping lines, acting in accordance with the desires of their customers, minimize the potential for tidal delays by loading vessels only to drafts which do not require tidal advantage to call at the port.

HULL CLEARANCE

The harbor pilots generally require that the maximum draft for port transit allow for 1 foot of clearance between the moving vessel and the channel bottom. Examination of port records comfirmed that regular visits are at 34 feet under existing conditions. Comparison of the 35-foot authorized depth to the moving draft of the vessel of 34 feet gives a difference of 1 foot under existing conditions. It should be noted that this estimate refers to the moving draft of the vessel as opposed to the static draft which is usually less. Vessel drafts increase when underway because the ship sinks lower in the water due to motion and dynamic forces on the hull. The propeller's motion also works to draw the rear or stern of the vessel down farther (squat) in the water. The large dry bulk vessels and tankers with loaded static drafts of 33 feet tend to have sinkage and squat of about 1 foot when underway. This leaves a safety clearance of 1 foot between the vessel hull underway and the channel bottom. The combination of vessel draft, sinkage, squat, and safety clearance provide the project channel dimension as a basis for economic analysis and depth selection.

Corps' manuals provide a methodology for calculating the channel depth needed for a vessel in motion to ensure risk-free operation. That operation may be assumed when the conditions, derived from application of manual criteria, are met. The difference, using that criteria, between the vessel hull in motion and the channel bottom, is 2 feet for safety clearance. Allowing 1 foot for sinkage and squat, the corresponding risk-free draft for a static vessel at Canaveral under the without project condition would be 32 feet. In 1988 vessels at static drafts greater than 32 feet made 52 trips. Since those vessels call routinely without using tidal advantage, it is apparent that current operating practices are not risk-free.

PROJECT WIDTHS

The bottom width of the selected plan, as displayed above, conform to existing conditions as well as the general guidelines stipulated in the EM. The one area that received special attention during early Washington level review was the Inner Entrance Channel. That area and the need for real time ship simulation studies to model that area are discussed below.

Inner Entrance Channel Width. As displayed on this feasibility report's plates, Canaveral Harbor currently consists of an Outer Entrance Channel 37'(44') X 400', an Inner Entrance Channel 36' X 300', an access channel 31' X 400', a Trident Submarine basin, a middle turning basin, and a west turning basin. Part of the proposed project calls for enlarging the Inner Entrance Channel to 39' X 400' to match the civil works requirements for the entrance and access channels. The widening to 400 feet will extend the existing channel 50 feet to the north and 50 feet to the south along the existing centerline of the channel. That portion of the project area is shown on plate B-1. The Inner Entrance Channel described in this feasibility report coincides with the Inner Reach depicted on the nautical chart in figure B-1.

Engineer Manual EM 1110-2-1613, "Hydraulic Design of Deep Draft Navigation Projects" (the EM), and Engineer Regulation ER 1110-2-1404, "Deep Draft Navigation Project Design" (the ER), were used in the planning and design of the subject project. Those documents provide the basis for what the professional engineer use in planning and designing our Nation's deep draft waterways. In essence, the documents stipulate that the channel design will be a safe, efficient, and optimized product. Real time ship simulation studies are required when those design requirements cannot be met by the normal design and layout process using the general guidelines presented in the EM. In the case of Canaveral Harbor, those design requirements have been met except for the exact optimized width. The exact optimized width is not required if the project meets its requirements in regards to safety and efficiency. The following excerpt from the EM is provided for clarification on this point.

> "Safety and efficiency should receive primary consideration before the project is optimized with respect to cost"

The selected plan, as described in the subject feasibility report, provides for a project that will produce an excess of NED benefits over costs and therefore, is an efficient product.

The safety accomplishments of the project are discussed below. However, before proceeding, the following excerpt from the EM is also provided for clarification on the points being made.

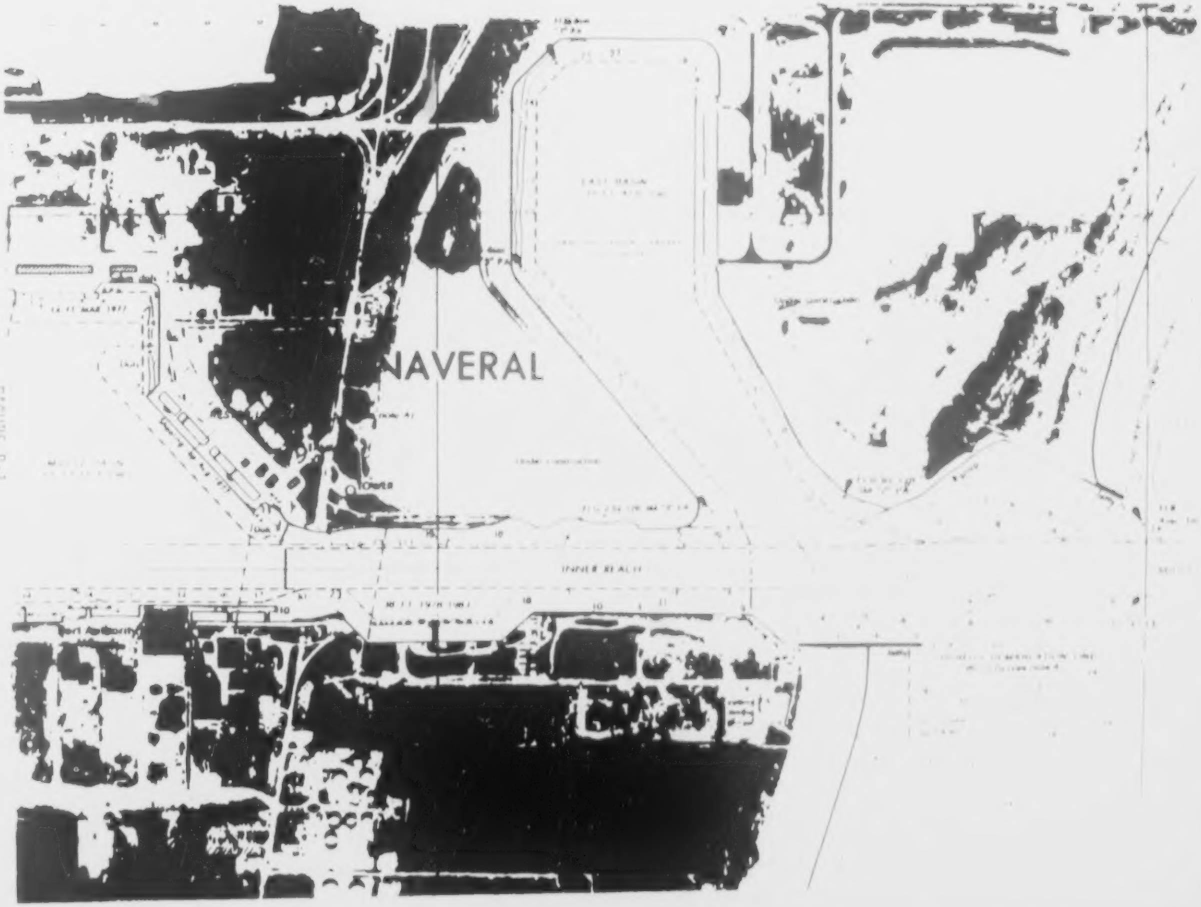

NAVERAL
INNER REACH

FIGURE D-1

> **"Safety of the project will depend on the size and maneuverability of the vessels using the waterway, size and type of channel and navigation aids provided, effects of currents and wind, and experience and judgment of the pilot. Since the human factor (judgment and reaction of the pilot) is involved and is difficult to evaluate, potentially hazardous conditions should be eliminated insofar as practicable"**

The following paragraphs discuss the safety aspects of the selected plan, explain how the existing plan provides for increased project safety, and evaluate the potential for real time ship simulation studies to improve on the project's design and safety.

a. Vessel size and maneuverability. The projected vessel fleet for the subject project is the same as the existing fleet. The project will deliver NED benefits by more efficiently loading the existing fleet. The selected plan, with a 400-foot width, will improve handling problems by reducing bank effects and providing additional maneuvering room for the existing fleet. The channel centerline will remain the same as the existing project except for 700 feet near the Middle Turning. In that reach the centerline makes a transition of 50 feet to the north. With the wider channel that transition poses no safety problems. The pilots are in agreement with that finding. Safety will be further improved because the with project deepening will transit future cargoes on fewer vessel trips than without a project. This will improve project safety by providing fewer encounter opportunities for vessel mishaps.

b. Size and type of channel and navigation aids. The selected plan calls for the Inner Reach to be 40 feet deep by 400 feet wide. Those channel dimensions are fairly common for several deep draft projects. The plan will use existing navigation aids except for improvements in marking the channel sides as explained in paragraph e.

c. Effects of currents and wind. In regards to project hydrodynamics, no crosscurrents nor yawing forces exist in the Inner Reach. Tidal velocities are low because of the small drainage area of the harbor. The Canaveral lock located between the harbor and the Banana River reduces the tidal effects enormously: Wind is the only natural force that presents a problem. The mean wind speed for the area is approximately 8 knots. The primary morning direction is northwest from October through April and the primary afternoon direction is east year round. North or south wind directions do contribute to maneuvering difficulties from time to time, but the dike on the north side of the channel tends to partially block winds from that general direction.

The vessel fleet for the with project condition is the same as the existing fleet. Moreover, the with project condition only increases the draft of existing vessels that have transited the project. The design in effect reduces handling problems because a more fully loaded vessel reduces the effective sail area and therefore decreases wind generated handling problems. Additionally, the 400-foot width also provides an additional margin of safety by providing additional width for ballast draft transits where the vessel sail area is the largest.

d. Experience and judgment of the pilots. Contacts with local pilots, as discussed in the feasibility report, indicate that a clear and present need exists to widen the channel to a width greater that 300 feet. A statement provided by the local pilots is presented below:

> "The channel narrows from 400' to 300' at the East end of the Inner Channel immediately south of Beacon #3. Inbound with large deep ships "smelling the bottom" we have to allow for a severe shear to the North at this point. The situation can be critical especially when we have to use a little extra speed to overcome the effects of high winds."

As stated in there support for the project, the pilots and the local sponsor support and request a widening of the Inner Channel to a 400' width. The selection of any width larger than 400' would not be considered a responsible choice for the design of the Inner Entrance Channel since that dimension would be larger than the entrance channel. Moreover, no problems have been documented for commercial navigation in the entrance or approach channels.

e. Removal of potentially hazardous conditions. Insofar as practical, the uneven transition from 400 feet in the Entrance Channel to 300' in the Inner Entrance Channel has been alleviated by the design of the selected plan. As depicted on the enclosed nautical chart, the centerline of the existing Inner Reach (Channel) is a straight line. However, the project width reduces asymmetrically in the transition from the Middle Reach to the Inner Reach (400' to 300'). The currently selected plan merely widens the Inner Reach on the existing centerline (and range towers) for a straight alignment between the Middle and Inner Reaches and removes a confusing and unmarked channel configuration. Except for the western 700 feet of the inner channel, which involves a transition of the channel centerline 50 feet to the north, the channel centerline remains straight. The U.S. Coast Guard has reviewed the various alignments for the channel and recommends the selected plan as presented in the feasibility report. The port pilots have also reviewed the plan and have no problems with it. The expense of real time ship simulation studies is not necessary to improve the alignment, satisfy the pilots, or satisfy the local sponsor, which is very much against doing ship simulations studies.

As demonstrated above, the currently selected design and alignment of the Inner Entrance Channel at a 40' depth and 400' width achieves the objectives of the EM and ER in regards to both project efficiency and safety. It also locates the proposed channel more in the center of existing and prospective port facilities as shown on plate B-1.

CONSTRUCTION

The cost estimate for first costs was based on mechanically dredging 949,000 c.y. of material from the Federal channel and an additional 83,000 c.y. of material from adjacent berthing areas. The material would be excavated by a mechanical dredge, loaded into hopper barges, and transported to an EPA approved ocean dredged material disposal site (ODMDS) approximately 6 southeast of the jettied entrance to the harbor. Prior to the commencement of a dredging contract for the project deepening, the maintenance quantities for the existing project will have to separated from the new work quantities. The maintenance quantities would be removed at Federal expense under the existing project authorization. The project dredging could be done under one contract or under separate contracts.

Widening of the existing Inner Channel would necessitate the removal and replacement of stone protection both on the north and the south sides of the channel. The northerly portion of this work would be accomplished utilizing a crane working from a barge. All non-salvageable stone would be disposed of by placing it onto a barge and hauling it to the ocean disposal site. On the south side of the channel, stone would be removed by a crane working from shore and loaded onto dump trucks for hauling and dumping at a designated stockpile in the vicinity. Upon completion of dredging operations, the stone would be replaced.

Widening of the existing channel would also necessitate the realignment of 32,000 c.y. of existing dike on the north side of the channel. Material would be excavated with a dragline, placed in layers and compacted. This dike work would be accomplished from shore. A typical section of that dike area is on plate B-1.

The construction of the navigation features of the selected plan would take about 8 months to complete. Project dredging would also necessitate the relocation of a finger pier located on the north side of the inner reach and a cable crossing located near the same area. The relocation of those non-Federal facilities will have to be significantly accomplished prior to initiation of Federal dredging activities. The total project will require about one year of construction time.

DISPOSAL AREAS

All existing upland disposal areas have been either designated for future development or other uses. The only disposal alternative available for the new work dredging and the maintenance of those works is the ODMDS located approximately 6 miles southeast of the harbor entrance.

REAL ESTATE AND RELOCATIONS

The Canaveral Port Authority, as the local sponsor, would be required to furnish permanent construction easements and rights-of-way of sufficient length and width to encompass the limits of the proposed project. Utility relocations and other items requiring non-Federal contributions are presented in the cost estimates. Those estimates include relocating an existing cable crossing, a finger pier, stone protection on the north and south side of the inner channel reach, and disposal area dikes.

OPERATION AND MAINTENANCE (O&M)

Existing operations and activities were reviewed to determine the effects of the new navigation improvements on existing costs to operate and maintain Canaveral Harbor. Shoaling rates were developed from the review of contract drawings and hydrographic surveys. The operation and maintenance (O&M) properties are displayed below only for the existing civil works portion of the harbor project. Advanced maintenance has historically been varied from contract to contract and has averaged 1 foot or more. In addition to advanced maintenance, past contracts have included 1 to 2 feet of overdepth dredging for dredging tolerances as a separate contract pay item. Current South Atlantic Division maintenance dredging policy does not allow for any pay yardage for dredging tolerances or inaccuracies. That policy is reflected in the analyses summarized in the following tables.

Navigation Feature	Dredge Plant	D/A	Shoaling Rate ft/yr	Existing Interval	Annual Amount 1,000 cy	Feet of Advanced Maintenance
Extended Civil Works Entrance Channel	Hopper	ODMDS	0.25	10 yrs	16	0
Inner Channel	Hopper	do.	0.50	5-10 yrs	10	1-2
Main Turning Basin & 39-foot West Access Channel	do.	do.	0.50	5-10 yrs	13	1-2
35-foot West Access Channel & Turning Basin	do.	do.	0.25	8-12 yrs	9	0

Maintenance volumes for the Navy and civil works portion of the Federal harbor project are shown below.

MAINTENANCE DREDGING HISTORY FOR CANAVERAL HARBOR

Year	Quantity (c.y.)
1976	341,888
1977	48,017
1978	282,517
1980	1,402,507
1981	257,326
1983	713,132
1985	3,017,109
1987	63,370

The advanced maintenance needs of the selected plan were evaluated. The incremental costs for different amounts of advanced maintenance for the Inner Channel, Main Turning Basin, and 39-foot West Access Channel are displayed below. The without project condition is represented by the 1-foot amount since that amount is the long term average for the harbor. The negative amount represents a savings for the 2-foot increment. Those amounts are added to the annual costs for the recommended plan for the corresponding amounts of advanced maintenance overdepth to determine the depth with the least amount of overall costs.

Advanced Maintenance	O&M Costs	Incremental Costs
0 feet A.M.	$573,000	$342,000
1 foot A.M.	$231,000	0
2 feet A.M.	$162,000	($69,000)

Based on its costs savings, 1-foot of advanced maintenance was selected for the recommended plan and its O&M properties are displayed below.

Navigation Feature	Incremental Costs	A.M. ft	Dredge Tolerance	With Project Interval	Shared Mob/Demob
Extended Civil Works Entrance Channel	$26,000	0	0	10 yrs	yes
Inner Channel	$0	1	0	5-10 yrs	yes
Main Turning Basin & 39' West Access Channel	$0	1	0	5-10 yrs	yes

The above increase in O&M project costs are the with project cost for the extended civil works entrance channel and reflects the provisions stipulated in Section 117 of the River and Harbor and Flood Control Act of 1968, Public Law 90-483. Section 117 authorized the use of civil works funds for the maintenance of excess project dimensions required and constructed for defense needs. Those excess dimensions must also serve the essential needs of general commerce. As stated earlier, there are no incremental costs for O&M for the Inner Channel and the Main Turning Basin.

AIDS TO NAVIGATION

The U.S. Coast Guard (USCG) has reviewed the plans presented in this report. The U.S.C.G. concurs with the selected plan. That plan will not require any additional funds for the installation, operation, maintenance, and replacement for the aids to navigation at Canaveral Harbor.

COST ESTIMATES

Cost estimates for the selected plan on the following pages are based on September 1989 price levels. The construction periods for the various alternative plans are displayed in a table following the cost estimates. Those estimates are based on the new work dredging quantities.

SEPTEMBER, 1989 PRICE LEVEL

CANAVERAL HARBOR IMPROVEMENTS
CANAVERAL HARBOR IMPROVEMENTS
FEASIBILITY STUDY - RECOMMENDED PLAN
PLAN A - 39-FOOT PROJECT

ACCOUNT CODE	ITEM	Estimated Cost	Contingency	Total Cost
02.-.-.-	RELOCATIONS			
02.3.-.-	CEMETARIES, UTILITIES, AND STRUCTURES, Construction Activities	1,478,000	370,000	1,848,000
12.-.-.-	DREDGING			
	Channel	4,978,000	1,245,000	6,223,000
	Berthing Areas	683,000	171,000	854,000
14.-.-.-	RECREATIONAL FACILITIES			
	Jetty Fishing Walkway	331,000	55,000	386,000
	Canaveral Harbor Lock Park	354,000	62,000	416,000
	TOTAL CONSTRUCTION COST	7,824,000	1,903,000	9,727,000
01.-.-.-	LANDS AND DAMAGES	187,000	47,000	234,000
30.-.-.-	PLANNING, ENGINEERING AND DESIGN	625,000	153,000	778,000
31.-.-.-	CONSTRUCTION MANAGEMENT	547,000	133,000	680,000
	TOTAL PROJECT COSTS	$9,183,000	$2,236,000	$11,419,000

SEPTEMBER, 1989 PRICE LEVEL

CANAVERAL HARBOR IMPROVEMENTS
FEASIBILITY STUDY - RECOMMENDED PLAN
PLAN A - 39-FOOT PROJECT

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY (In acct. 02.0.Z.-)	TOTAL PROJECT COST
02.-.-.-	RELOCATIONS							
02.3.-.-	CEMETARIES, UTILITIES, AND STRUCTURES, Construction Activities							
02.3.2.-	Utilities							
	Marine Cable Crossing	1	JOB	LS	730,000	25	182,500	912,500
02.3.3.-	Structures							
02.3.3.B	Site Work, Marine Finger Pier	1	JOB	LS	50,000	25	12,500	62,500
02.3.3.B	Site Work							
	Relocate Existing Dike on North Side	32,000	CY	2.40	76,800	25	19,200	96,000
02.3.3.B	Structures, North Side							
02.3.3.B	Remove Existing Stone Protection	2,000	CY	15.00	30,000	25	7,500	37,500
02.3.3.B	Bedding Stone	400	TON	42.00	16,800	25	4,200	21,000
02.3.3.B	Armor Stone	3,700	TON	63.00	233,100	25	58,275	291,375
02.3.3.B	Structures, South Side							
02.3.3.B	Remove Existing Stone Protection	3,000	CY	25.00	75,000	25	18,750	93,750
02.3.3.B	Replace Bedding Stone	800	TON	42.00	33,600	25	8,400	42,000
02.3.3.B	Replace Armor Stone	3,700	TON	63.00	233,100	25	58,275	291,375
	Subtotal, Construction Costs:				$1,478,000			
02.0.Z.-	Contingencies @ average of 25.0%						$370,000	
02.-.-.-	Relocations Total:							$1,848,000
30.-.-.-	PLANNING, ENGINEERING AND DESIGN				118,000		30,000	148,000
31.-.-.-	CONSTRUCTION MANAGEMENT				103,000		26,000	129,000
	TOTAL PROJECT COSTS				$1,699,000		$426,000	$2,125,000

SEPTEMBER, 1989 PRICE LEVEL

CANAVERAL HARBOR IMPROVEMENTS
FEASIBILITY STUDY - RECOMMENDED PLAN
PLAN A - 39-FOOT PROJECT

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY (in acct. 12.0.2.-)	TOTAL PROJECT COST
12.-.-.-	DREDGING							
12.0.A.-	Mobilization and Demobilization	1	L.S.	393,000	393,000	25	98,250	491,250
12.0.4.-	Mechanical Excavation							
12.0.4.B	Deepening from Trident Basin to Cement Facility Docks, including Middle Turning Basin	1,069,000	CY	4.14	4,425,660	25	1,106,415	5,532,075
12.0.R.-	Associated General Items							
12.0.R.B	Turtle Monitoring	3.4	MO	40,000	136,000	25	34,000	170,000
12.0.R.B	Turbidity Monitoring	3.4	MO	7,000	23,800	25	5,950	29,750
	Subtotal, Construction Costs:				$4,978,000			
12.0.2.-	Contingencies @ average of 25.0%						$1,245,000	
12.-.-.-	Dredging Total:							$6,223,000
30.-.-.-	PLANNING, ENGINEERING AND DESIGN				398,000		100,000	498,000
31.-.-.-	CONSTRUCTION MANAGEMENT				348,000		87,000	435,000
	TOTAL PROJECT COSTS				$5,724,000		$1,432,000	$7,156,000

SEPTEMBER, 1989 PRICE LEVEL

CANAVERAL HARBOR IMPROVEMENTS
FEASIBILITY STUDY - RECOMMENDED PLAN
PLAN A - 39-FOOT PROJECT

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY (In acct. 12.0.Z.-)	TOTAL PROJECT COST
12.-.-.-	DREDGING							
12.0.4.-	Mechanical Excavation							
12.0.4.B	Berthing Areas	163,000	CY	4.02	655,260	25	163,815	819,075
12.0.R.-	Associated General Items							
12.0.R.B	Turtle Monitoring	0.6	MO	40,000	24,000	25	6,000	30,000
12.0.R.B	Turbidity Monitoring	0.6	MO	7,000	4,200	25	1,050	5,250
	Subtotal, Construction Costs:				$683,000			
12.0.Z.-	Contingencies @ average of 25.0%						$171,000	
12.-.-.-	Dredging Total:							$854,000
30.-.-.-	PLANNING, ENGINEERING AND DESIGN				55,000		14,000	69,000
31.-.-.-	CONSTRUCTION MANAGEMENT				48,000		12,000	60,000
	TOTAL PROJECT COSTS				$786,000		$197,000	$983,000

SEPTEMBER, 1989 PRICE LEVEL

CANAVERAL HARBOR RECREATION FACILITIES
FEASIBILITY STUDY
Jetty Fishing Walkway

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY (in acct. 14.0.Z.-)	TOTAL PROJECT COST
14.-.-.-	RECREATION FACILITIES Jetty Fishing Walkway							
14.0.A.-	Mobilization & Demobilization	1	JOB	LS	25,000	12	3,000	28,000
14.0.3.-	Activity Guides and Controls							
14.0.3.B	P.C. Concrete Posts 10" x 10"	256	EA	50.00	12,800	20	2,560	15,360
14.0.3 B	Cable between Posts	6,700	LF	2.50	16,750	12	2,010	18,760
14.0.P.-	Concrete							
14.0.P.C	Chinking Stone	475	TON	87.00	41,325	30	12,398	53,723
14.U.P.C	Concrete	1,911	CY	86.00	164,346	12	19,722	184,068
14.0.P.C	Concrete Steps with Aluminum Handrail	1	EA	1,600	1,600	20	320	1,920
14.0.P.C	Conc. Steps w/ Al. Hand., Ramp & Platform	1	JOB	LS	6,300	20	1,260	7,560
14.0.P.C	Bollards	36	EA	125.00	44,100	20	8,820	52,920
14.0.P.C	Fish Cleaning Table w/ Sink & Light above	1	JOB	LS	800	12	96	896
14.0.6.-	Utilities							
14.0.6.Q	~~Water~~ Service to Fish Cleaning Table	1	JOB	LS	4,000	30	1,200	5,200
14.0.6.R	Elec. Serv. to Bollards & F. Clean. Table	1	JOB	LS	13,500	30	4,050	17,550
	Subtotal, Construction Costs:				$331,000			
14.0.Z.-	Contingencies @ average of 16.6%						$55,000	
14.-.-.-	Recreation Facilities Total:							$386,000
30.-.-.-	PLANNING, ENGINEERING AND DESIGN				26,000		4,000	30,000
31.-.-.-	CONSTRUCTION MANAGEMENT				23,000		4,000	27,000
	TOTAL PROJECT COSTS				$380,000		$63,000	$443,000

SEPTEMBER, 1989 PRICE LEVEL

CANAVERAL HARBOR RECREATION FACILITIES
FEASIBILITY STUDY
Canaveral Harbor Lock Park

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY (In acct. 14.0.Z.-)	TOTAL PROJECT COST
16.-.-.-	RECREATION FACILITIES Canaveral Harbor Lock Park							
16.0.C.-	Permanent Access Roads and Parking:							
16.0.C.B	Asphalt Pavement	779	SY	26.25	20,449	12	2,454	22,903
16.0.C.B	Concrete Curb	440	LF	9.30	4,092	12	491	4,583
16.0.C.B	Turf Stone	586	SY	24.50	14,357	12	1,723	16,080
16.0.1.-	Parking Lots and Service Roads:							
16.0.1.B	Concrete Wheel Stops	34	EA	26.75	910	12	109	1,019
16.0.2.-	Site Grading and Landscaping:							
16.0.2.B	Entrance Sign	2	EA	1,200	2,400	25	600	3,000
16.0.2.B	Interpretive Sign	1	EA	500	500	25	125	625
16.0.2.B	Trail Signs	5	EA	125	625	12	75	700
16.0.2.B	Landscaping	1	JOB	LS	21,900	20	4,380	26,280
16.0.2.Q	Irrigation	1	JOB	LS	17,000	30	5,100	22,100
16.0.3.-	Activity Guides and Controls:							
16.0.3.B	Pavers Interlock	200	SF	35.00	7,000	12	840	7,840
16.0.3.B	Remove Chain Link Fence	100	LF	3.50	350	25	88	438
16.0.3.B	Foot Trails (Crushed Stone) 6' wide	854	LF	12.45	10,632	12	1,276	11,908
16.0.3.B	Entry Fence	2	EA	1,600	3,200	12	384	3,584
16.0.3.B	Gate 12' (Entrance)	2	EA	1,400	2,800	25	700	3,500
16.0.3.B	Wood Fence	570	LF	28.00	15,960	20	3,192	19,152
16.0.3.B	Edging for Foot Trail	1,708	LF	1.10	1,879	15	282	2,161
16.0.3.B	Bollards	6	EA	500.00	3,000	20	600	3,600
16.0.3.F	Boardwalks	133	LF	140.00	18,620	20	3,724	22,344
16.0.4.-	Day Use Areas:							
16.0.4.B	Grill (Individual Shelter)	12	EA	115.00	1,380	12	166	1,546
16.0.4.B	Grill (Group)	6	EA	300.00	1,800	12	216	2,016
16.0.4.B	Play Structure	1	EA	14,000	14,000	12	1,680	15,680
16.0.4.B	Picnic Tables	18	EA	190.00	3,420	12	410	3,830
16.0.4.B	Benches for Tables	36	EA	275.00	9,900	12	1,188	11,088
16.0.4.B	Timber Edging	200	LF	3.00	600	12	72	672
16.0.4.B	Sand 6" (Playground)	46	CY	15.00	690	12	83	773
16.0.4.F	Group Shelter (600 sf each)	2	EA	18,600	37,200	12	4,464	41,664
16.0.4.F	Individual Shelter	6	EA	1,400	8,400	12	1,008	9,408

SEPTEMBER, 1989 PRICE LEVEL

CANAVERAL HARBOR RECREATION FACILITIES
FEASIBILITY STUDY
Canaveral Harbor Lock Park

ACCOUNT CODE	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT	%	CONTINGENCY (In acct. 14.0.Z.-)	TOTAL PROJECT COST
14.-.-.-	RECREATION FACILITIES Canaveral Harbor Lock Park							
14.0.6.-	Utilities							
14.0.6.8	Wastewater	1	JOB	LS	8,700	20	1,740	10,440
14.0.6.8	Water (Well)	1	EA	1,300	1,300	30	390	1,690
14.0.6.8	Storm Sewer	1	JOB	LS	37,500	20	7,500	45,000
14.0.6.8	Reroute Electrical & Telephone	1	JOB	LS	1,200	30	360	1,560
14.0.6.R	Electrical Work	1	JOB	LS	32,800	20	6,560	39,360
14.0.P.-	Utilities							
14.0.P.-	Restroom (575 sf)	1	EA	47,200	47,200	20	9,440	56,640
14.0.P.-	Bench (Park)	3	EA	330.00	990	12	119	1,109
14.0.P.-	Water Fountain	1	EA	800.00	800	12	96	896
14.0.R.-	Utilities							
14.0.R.8	Trash Receptacles	10	EA	90.00	900	12	108	1,008
	Subtotal Construction Costs:				$354,000			
14.0.Z.-	Contingencies @ average of 17.5%						$62,000	
14.-.-.-	Recreation Facilities Total:							$416,000
30.-.-.-	PLANNING, ENGINEERING AND DESIGN				28,000		5,000	33,000
31.-.-.-	CONSTRUCTION MANAGEMENT				25,000		4,000	29,000
	TOTAL PROJECT COSTS				$407,000		$71,000	$478,000

CANAVERAL HARBOR IMPROVEMENTS September, 1989 Price Level

Construction Periods:

Alternative 2A -- 38 Foot Project	4.5 Months
Alternative 2A -- 40 Foot Project	5.7 Months
Alternative 2A -- 42 Foot Project	7.0 Months
Alternative 3A -- 38 Foot Project	6.6 Months
Alternative 3A -- 40 Foot Project	7.7 Months
Alternative 3A -- 42 Foot Project	9.0 Months
Canaveral Harbor Lock Park	6.0 Months
Jetty Fishing Walkway	12.0 Months

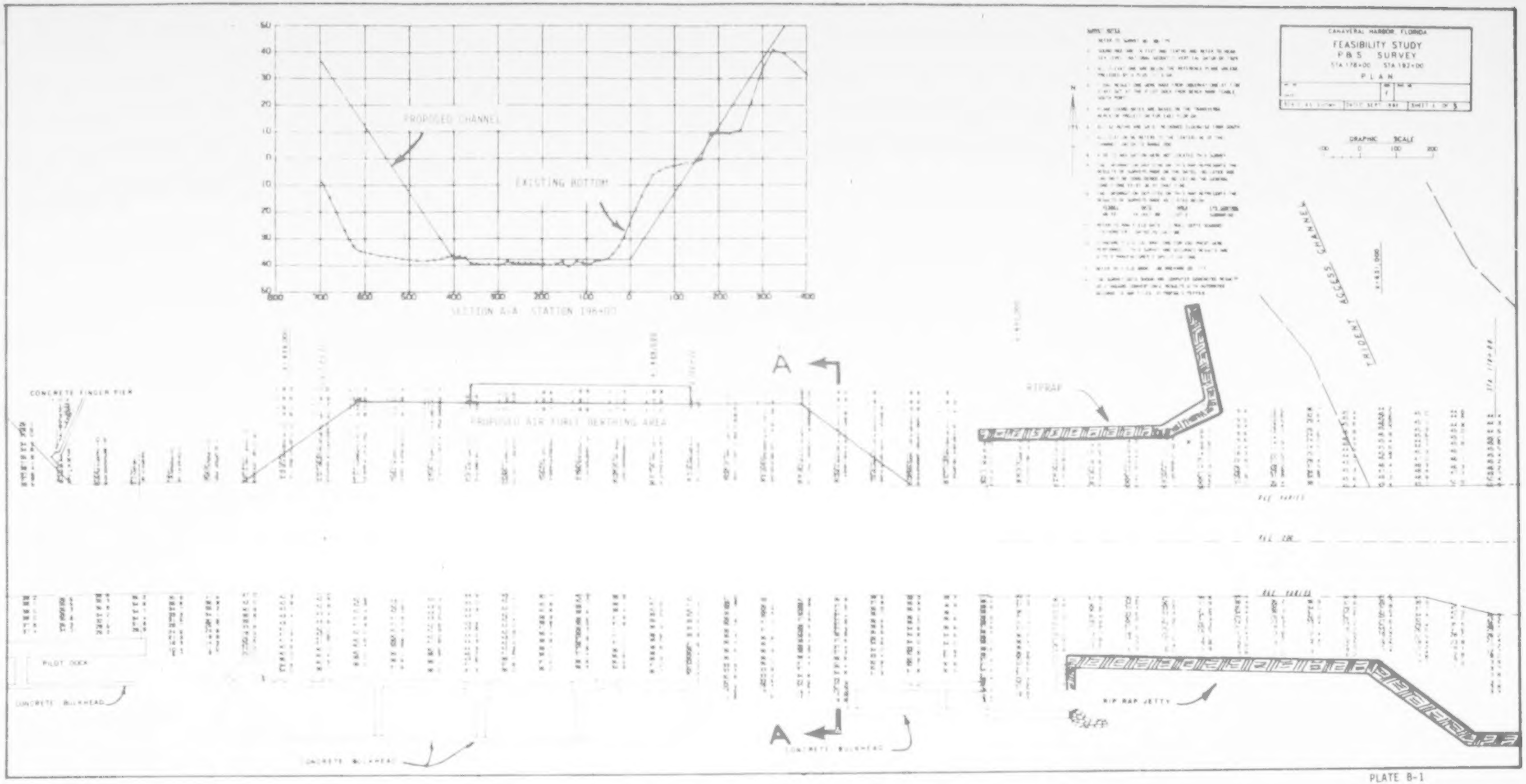

CANAVERAL HARBOR, FLORIDA
FEASIBILITY STUDY
P & S SURVEY
STA 178+00 STA 192+00
PLAN
DATE: SEPT. 1981
SHEET 1 OF 3
GRAPHIC SCALE
100
0
100
200
N
TRIDENT ACCESS CHANNEL
PROPOSED CHANNEL
EXISTING BOTTOM
SECTION A-A STATION 196+00
50
40
30
20
10
0
10
20
30
40
50
800
700
600
500
400
300
200
100
0
100
200
300
400
A
A
RIPRAP
RIP RAP JETTY
PROPOSED AIR FORCE BERTHING AREA
CONCRETE FINGER PIER
PILOT DOCK
CONCRETE BULKHEAD
CONCRETE BULKHEAD
CONCRETE BULKHEAD

PLATE B-1

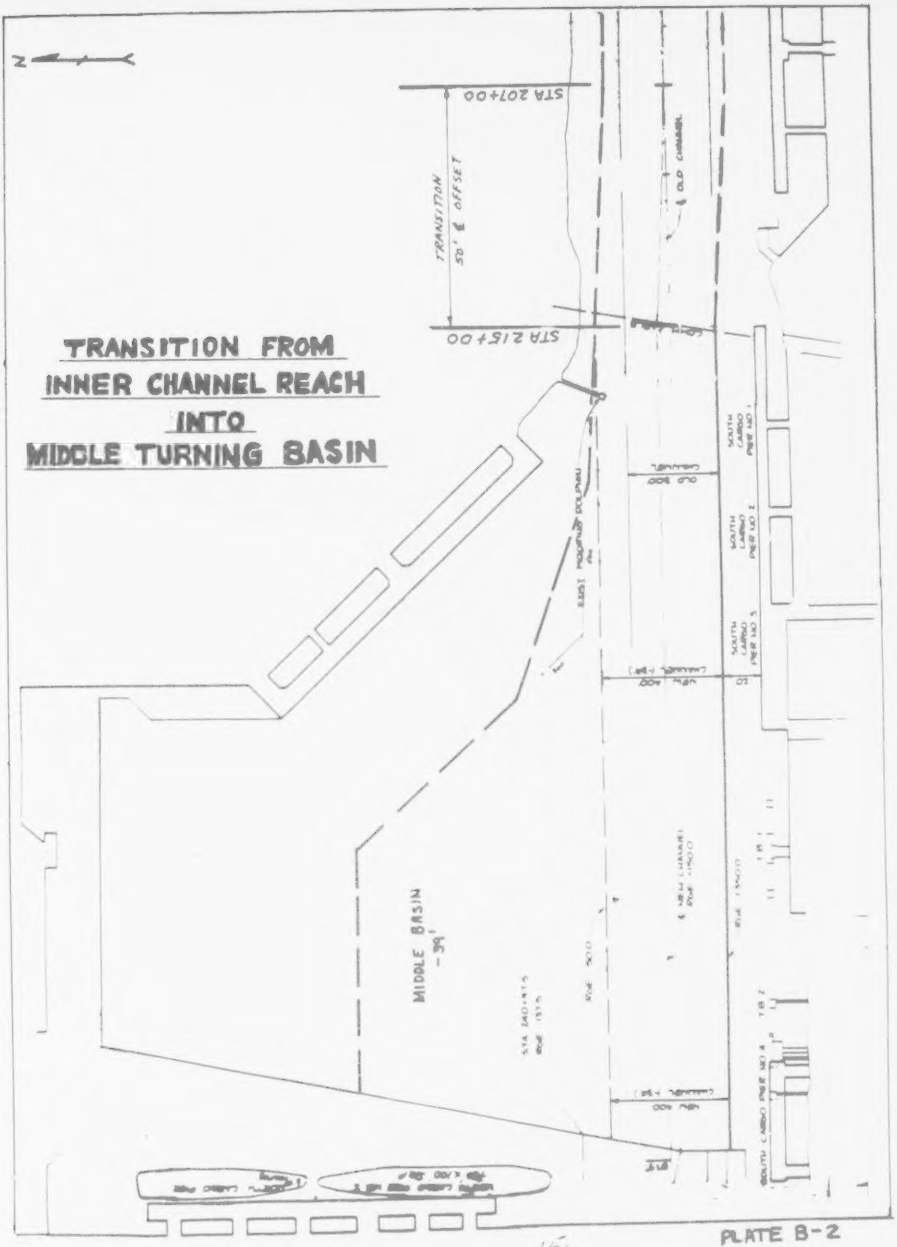

N
TRANSITION FROM INNER CHANNEL REACH INTO MIDDLE TURNING BASIN
STA 207+00
STA 215+00
TRANSITION 50' ℄ OFFSET
℄ OLD CHANNEL
EAST MOORING DOLPHIN
OLD 800 CHANNEL
NEW 400 CHANNEL (-38')
SOUTH CARGO PIER NO 1
SOUTH CARGO PIER NO 2
SOUTH CARGO PIER NO 3
MIDDLE BASIN -39'
SOUTH CARGO PIER NO 4

PLATE B-2

150

APPENDIX C

GEOTECHNICAL INVESTIGATIONS

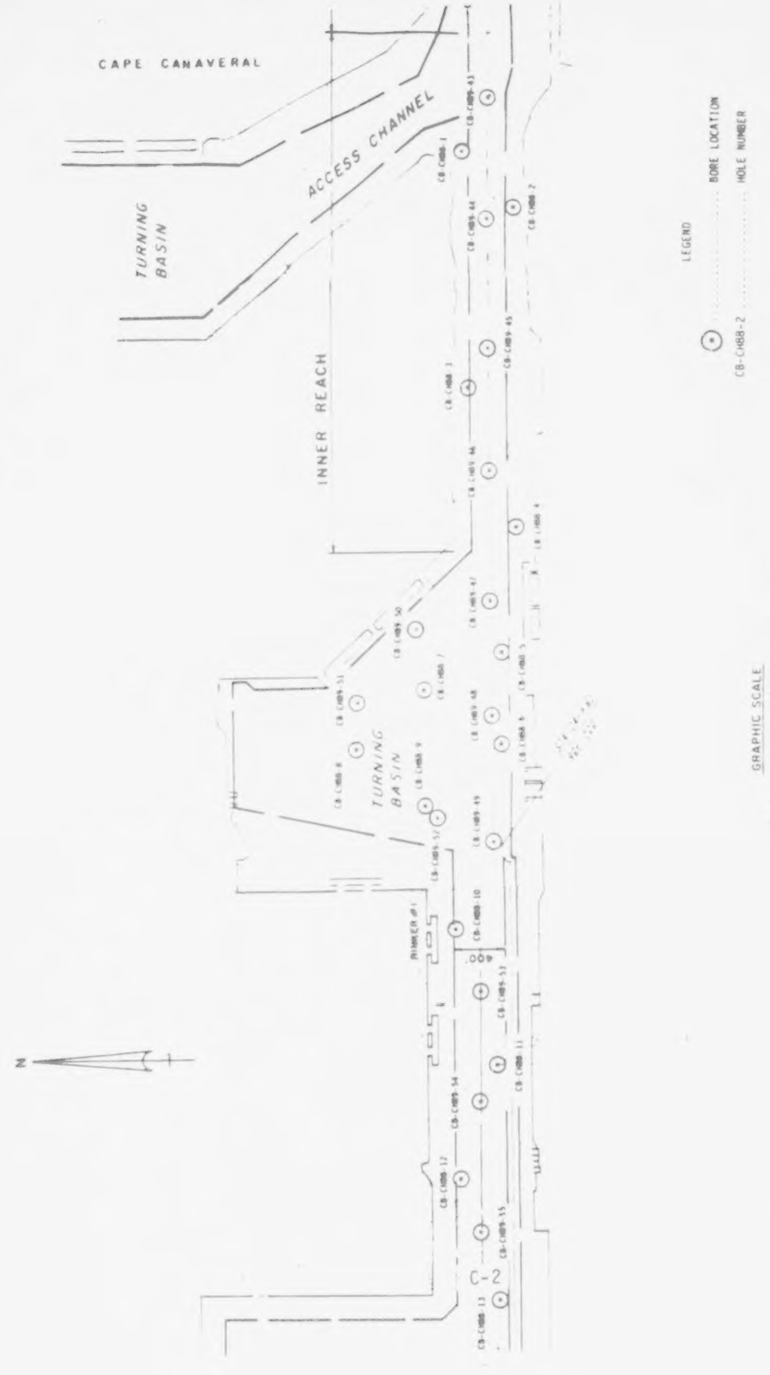
1. Investigations Performed. Thirteen core borings were drilled in Canaveral Harbor to identify the types and characteristics of the subsurface materials to be dredged as they relate to excavation methods, disposal methods and selection of disposal area location. The materials were sampled using a 2" I.D. X 5' long solid sampler. The samples were collected in jars and stored in core boxes at the Corps of Engineers warehouse, Jacksonville, Florida. The location of the core borings are shown on figure C-1 on page C-2. The core boring logs are shown on pages C-3 through C-29.

2. Materials Encountered. Interbedded unconsolidated materials lie below the channel bottom, the middle turning basin and within the channel widening area. Sampled elevations vary approximately form -22.0 MLW to -48 MlW. The materials consist of sand, silt and clay with most being silt and clay. No rock was encountered.

3. Excavation. Port Canaveral excavation will be mostly silt and clay with little sand. Excavation is expected to be accomplished by hydraulic pipeline dredge or by bucket or dipper type operation.

4. Laboratory Tests. Representative samples of the unconsolidated material were sent to the Corps of Engineers SAD Laboratory for grain size and sedimentation rate analysis. The results of these tests are shown on pages C-29 through C-42.

5. Considerations for Material Disposal. Suitable materials for dike construction or beach nourishment can not be obtained from the dredging operations. Most of the material consists of silt and clay, both unsuitable for dike construction and only minor amounts of sand will be excavated.


CAPE CANAVERAL
TURNING BASIN
ACCESS CHANNEL
INNER REACH
TURNING BASIN
BUNKER #1
C-2
N
CB-CH89-43
CB-CH88-1
CB-CH89-44
CB-CH88-2
CB-CH89-45
CB-CH88-3
CB-CH89-46
CB-CH88-4
CB-CH89-47
CB-CH89-50
CB-CH88-5
CB-CH89-51
CB-CH88-7
CB-CH89-48
CB-CH88-8
CB-CH88-9
CB-CH88-6
CB-CH89-52
CB-CH89-49
CB-CH88-10
CB-CH89-53
CB-CH88-11
CB-CH89-54
CB-CH88-12
CB-CH89-55
CB-CH88-13
LEGEND
BORE LOCATION
CB-CH88-2 HOLE NUMBER
GRAPHIC SCALE
500' 0 500' 1000'

CORE BORING
LOCATION MAP
FIGURE C-1

Hole No. CB-CH88-1

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS
1. PROJECT Canaveral Harbor		10. SIZE AND TYPE OF BIT see remarks	
2. LOCATION (Coordinates or Station) x=630,562 Y=1,481,885		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW	
3. DRILLING AGENCY Corps of Engineers		12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500	
4. HOLE NO. (As shown on drawing title and file number)	CB-CH88-1	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED | UNDISTURBED
5. NAME OF DRILLER R. Gordon		14. TOTAL NUMBER CORE BOXES 1	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.		15. ELEVATION GROUND WATER Tidal	
		16. DATE HOLE	STARTED 30 Aug 88 COMPLETED 30 Aug 88
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE -22.3'	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING 60%	
9. TOTAL DEPTH OF HOLE 25.0'		19. [illegible] Geologist J. Hand	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						Bit or Barrel
-22.3	0.0					-22.3 Blows/ft
		· ·	Sand, very fine quartz, a trace of silt, gray (SP)	40	1	2" Sampler settled 9 9
-27.3	5.0					-27.3
		▨	Clay, slightly sandy, a trace of shell, gray (CH)	40	2	" settled 4 9
-29.9	7.6					
		· ·	Sand, very fine to fine quartz, a little shell and a trace of silt, gray (SP)		3	11 13
-32.3	10.0					-32.3
		▨	Clay, gray, a few brown traces of leaves and stems (CH)	20	4	" 3 2 3 3 [illegible]
						-37.3
				100	5	" settled 1 5
						-42.3
				100	6	" 2 1 2 3 4
-47.3	25.0					-47.3

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT Canaveral Harbor | HOLE NO. CB-CH88-1

Hole No. CB-CH88-2

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT Canaveral Harbor
2. LOCATION (Coordinates or Station) x=630,042 y=1,481,526
3. DRILLING AGENCY Corps of Engineers
4. HOLE NO. (As shown on drawing title and file number) CB-CH88-2
5. NAME OF DRILLER R. Gordon
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 7.0'
10. SIZE AND TYPE OF BIT see remarks
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW
12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES 1
15. ELEVATION GROUND WATER Tidal
16. DATE HOLE | STARTED 30 Aug 88 | COMPLETED 30 Aug 88
17. ELEVATION TOP OF HOLE -41.7
18. TOTAL CORE RECOVERY FOR BORING 70% %
19. [illegible] GEOLOGIST - J. Hand

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	[redacted] SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						Bit or Barrel
-41.7	0.0					-41.7 Blows/ft
			Silt with a little very fine quartz sand, gray (ML)	70	1	2" Sampler settled
-45.4	3.7	▨	Clay, with a little very fine quartz sand, gray (CH)		2	2 settled
-48.7	7.0					-48.7

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT Canaveral Harbor

HOLE NO. CB-Ch88-2

Hole No. CB-CH88-3

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District
SHEET 1 OF 1 SHEETS		

1. PROJECT Canaveral Harbor	10. SIZE AND TYPE OF BIT see remarks
2. LOCATION (Coordinates or Station) x=628,548 y=1,481,866	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW
3. DRILLING AGENCY Corps of Engineers	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) CB-CH88-3	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED —
5. NAME OF DRILLER R. Gordon	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.	15. ELEVATION GROUND WATER Tidal
	16. DATE HOLE — STARTED 31 Aug 88 — COMPLETED 31 Aug 88
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE -35.5'
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING 88% %
9. TOTAL DEPTH OF HOLE 10.8'	19. ~~SIGNATURE OF INSPECTOR~~ GEOLOGIST - J. Hand

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						Bit or Barrel
-35.5	0.0					-35.5 Blows/ft
-36.5	1.0	∴	Sand, fine quartz, silty, a piece of visquene, gray (SM)	90	1	2" Sampler 2
		‖			2	settled
-38.5	3.0	‖	Silt, a trace of very fine sand, gray (MH)			
		▨	Clay, a trace of very fine quartz sand, gray (CH)		3	-41.3
		▨	From -41.0 to -46.3, clay gray with a few brown traces of leaves and stems, a very few shells (CH)	100	4	settled
-46.3	10.8	▨				-46.3 1

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT Canaveral Harbor

HOLE NO CB-CH88-3

Hole No. CB-CH88-4

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT Canaveral Harbor	10. SIZE AND TYPE OF BIT see remarks
2. LOCATION (Coordinates or Station) x=627,554 y=1,481,604	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW
3. DRILLING AGENCY Corps of Engineers	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) CB-CH88-4	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN · DISTURBED · UNDISTURBED
	14. TOTAL NUMBER CORE BOXES 1
5. NAME OF DRILLER R. Gordon	15. ELEVATION GROUND WATER Tidal
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.	16. DATE HOLE · STARTED 31 Aug 88 · COMPLETED 31 Aug 88
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE -40.9
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING 80%
9. TOTAL DEPTH OF HOLE 5.0'	19. [redacted] GEOLOGIST - J. Hand

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	[redacted] SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						Bit or Barrel
-40.9	0.0					-40.9 Blows/ft Settle
-41.9	1.0	▥	Silt, a little very fine sand, gray (ML)		1	2" Sampler
		▨	Clay, gray, a few brown traces of leaves and stems (CH)	8	2	
-45.9	5.0					-45.9

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT Canaveral Harbor · HOLE NO. CB-CH88-4

Hole No. CB-CH88-5

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS
1. PROJECT Canaveral Harbor		10. SIZE AND TYPE OF BIT see remarks	
2. LOCATION (Coordinates or Station) x=626,707 y=1,481,5/6		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW	
3. DRILLING AGENCY Corps of Engineers		12. MANUFACTURER'S DESIGNATION OF DRILL Failings 1500	
4. HOLE NO. (As shown on drawing title and file number)	CB-CH88-5	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED / UNDISTURBED
5. NAME OF DRILLER R. Gordon		14. TOTAL NUMBER CORE BOXES 1	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.		15. ELEVATION GROUND WATER Tidal	
		16. DATE HOLE	STARTED 31 Aug 88 COMPLETED 31 Aug 88
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE -38.1	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING 98%	
9. TOTAL DEPTH OF HOLE 10.0'		19. ~~SIGNATURE OF INSPECTOR~~ GEOLOGIST - J. Hand	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	[redacted] SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						Bit or Barrel
-38.1	0.0					-38.1 Blows/ft
-39.4	1.3		Silt, a trace of very fine sand, gray (ML)	95	1	2" Sampler settled
		▨	Clay, gray, a few brown traces of leaves and stems (CH)		2	
						-43.1 4
						settled
				100	3	
-48.1	10.0					-48.1 7

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT Canaveral Harbor

HOLE NO. CB-CH88-5

Hole No. CB-CH88-6

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS
1. PROJECT Canaveral Harbor		10. SIZE AND TYPE OF BIT see remarks	
2. LOCATION (Coordinates or Station) x=625,725 y=1,481,670		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW	
3. DRILLING AGENCY Corps of Engineers		12. MANUFACTURER'S DESIGNATION OF DRILL Failings 1500	
4. HOLE NO. (As shown on drawing title and file number)	CB-CH88-6	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED | UNDISTURBED
5. NAME OF DRILLER R. Gordon		14. TOTAL NUMBER CORE BOXES 1	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.		15. ELEVATION GROUND WATER Tidal	
		16. DATE HOLE	STARTED 2 Sept 88 | COMPLETED 2 Sept 88
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE -40.6	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING 85% %	
9. TOTAL DEPTH OF HOLE 6.0 feet		19. ~~SIGNATURE OF INSPECTOR~~ GEOLOGIST - J. Hand	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
-40.6	0.0					Bit or Barrel -41.6 Blows/ft
-43.1	2.5	▥	Silt, gray-green (MH)	85	1	settled 2" Sampler
-46.6	6.0	▨	Clay, a trace of very fine quartz sand, gray, a few brown traces of leaves and stems (CH)		2	-47.6

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT Canaveral Harbor

HOLE NO. CB-CH88-6

Hole No. CB-CH88-7

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT Canaveral Harbor	10. SIZE AND TYPE OF BIT see remarks
2. LOCATION (Coordinates or Station) x=626,295 y=1,482,228	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW
3. DRILLING AGENCY Corps of Engineers	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) CB-CH88-7	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER R. Gordon	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.	15. ELEVATION GROUND WATER Tidal
	16. DATE HOLE — STARTED 1 Sept 88 — COMPLETED 1 Sept 88
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE -38.4
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING 90% %
9. TOTAL DEPTH OF HOLE 10.0'	19. SIGNATURE OF INSPECTOR GEOLOGIST J. Hand

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						Bit or Barrel
-38.4	0.0					-38.4 Blows/ft
-39.4	1.0	ǀǀǀ	Silt, gray (ML)		1	settled
-39.9	1.5	ǀǀǀ	Sand, very fine quartz, slightly silty (SM)	80	2	2" Sampler
		▨	Clay, gray (CH)		3	-43.4
		▨				settled
		▨		100	4	1
-48.4	10.0	▨				-48.4 5

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT Canaveral Harbor

HOLE NO. CB-CH88-7

Hole No. CB-CH88-8

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT Canaveral Harbor
2. LOCATION (Coordinates or Station) x=625,750 y= 1,482,840
3. DRILLING AGENCY Corps of Engineers
4. HOLE NO. (As shown on drawing title and file number) CB-CH88-8
5. NAME OF DRILLER R. Gordon
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 10.0'
10. SIZE AND TYPE OF BIT see remarks
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW
12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES 1
15. ELEVATION GROUND WATER Tidal
16. DATE HOLE | STARTED 1 Sept 88 | COMPLETED 1 Sept 88
17. ELEVATION TOP OF HOLE -40.8'
18. TOTAL CORE RECOVERY FOR BORING %
19. [redacted] GEOLOGIST J. Hand

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	[redacted] SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						Bit or Barrel
-40.8	0.0					-40.8 Blows/ft
		▥	Silt, maloderous, gray-green (MH)	100	1	settled
-42.8	2.0					
		▨	Clay, gray with a few brown traces of leaves and stems (CH)		2	2" Sampler
						-45.8
					3	settled
-47.8	7.0					2
-48.8	8.0	▨	Sand, very fine quartz, clayey, gray-brown, (SC)	100	4	7
		⁘			5	9
-50.8	10.0		Sand, very fine quartz, silty, calcareous, nodules and layers of moderately hard quartz sandstone light green (SM)			-50.8 8

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT Canaveral Harbor | HOLE NO CB-CH88-8

Hole No. CB-CH88-9

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT Canaveral Harbor	10. SIZE AND TYPE OF BIT see remarks
2. LOCATION (Coordinates or Station) x=625,242 Y=1,482,210	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW
3. DRILLING AGENCY Corps of Engineers	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) CB-CH88-9	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER R. Gordon	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.	15. ELEVATION GROUND WATER Tidal
	16. DATE HOLE — STARTED 1 Sept 88 — COMPLETED 1 Sept 88
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE -37.1
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING 70% %
9. TOTAL DEPTH OF HOLE 11.0'	19. ~~SIGNATURE OF INSPECTOR~~ GEOLOGIST - J. Hand

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						Bit or Barrel
-37.1	0.0					-37.1 Blows/ft
			Silt, gray-green (MH)		1	settled
-39.6	2.5		Clay, gray (CH)	85	2	2" Sampler
						-43.1 4
						settled
-45.1	8.0				3	3
-46.1	9.0		Sand, very fine quartz, clayey, gray-brown (SC)	50	4	6
			Sand, very fine quartz, some shell, very silty, calcareous nodules and layers of moderately hard quartz, sandstone, light green with white (SM)			9
-48.1	11.0					-48.1 4

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT Canaveral Harbor

HOLE NO. CB-CH88-9

Hole No. CB-CH88-10

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS
1. PROJECT Canaveral Harbor		10. SIZE AND TYPE OF BIT see remarks	
2. LOCATION (Coordinates or Station) x=624,388 y=1,481,971		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW	
3. DRILLING AGENCY Corps of Engineers		12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500	
4. HOLE NO. (As shown on drawing title and file number)	CB-CH88-10	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED / UNDISTURBED
5. NAME OF DRILLER R. Gordon		14. TOTAL NUMBER CORE BOXES 1	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.		15. ELEVATION GROUND WATER Tidal	
		16. DATE HOLE	STARTED 7 Sep / COMPLETED 7 Sept 88
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE -39.6	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING 60%	
9. TOTAL DEPTH OF HOLE 6.0'		19. GEOLOGIST J. Hand	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						Bit or Barrel
-39.6	0.0					-39.6 Blows/ft settled
-41.2	1.6	▥	Silt, maloderous, gray (MH)		1	
		▨	Clay, gray (CH)	60	2	2" Sampler 2 1 2 2 2
-45.6	6.0					-45.6

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT Canaveral Harbor

HOLE NO CB-CH88-10

Hole No. CB-CH88-11

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS
1. PROJECT Canaveral Harbor		10. SIZE AND TYPE OF BIT see remarks	
2. LOCATION (Coordinates or Station) x=623,408 y=1,481,615		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW	
3. DRILLING AGENCY Corps of Engineers		12. MANUFACTURER'S DESIGNATION OF DRILL Falling 1500	
4. HOLE NO. (As shown on drawing title and file number)	CB-CH88-11	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED / UNDISTURBED
5. NAME OF DRILLER R. Gordon		14. TOTAL NUMBER CORE BOXES 1	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.		16. DATE HOLE	STARTED 7 Sept 88 / COMPLETED 7 Sept 88
		15. ELEVATION GROUND WATER Tidal	
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE -35.4	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING 77%	
9. TOTAL DEPTH OF HOLE 11.0'		19. ~~SIGNATURE OF INSPECTOR~~ GEOLOGIST J. Hand	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						Bit or Barrel
-35.4	0.0					-35.4 Blows/ft
-38.4	3.0		Silt, Maloderous, gray-green (MH)	80	1	settled 2" Sampler
-39.8	4.4		Clay with a little very fine quartz sand, gray (CH)		2	
			Shell, medium sand size, silty, a trace of very fine quartz sand, white with gray		3	-41.4 4 5
						settled " 6 2 7
-46.4	11.0			60	4	-46.4 15

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT Canaveral Harbor

HOLE NO. CB-CH88-11

Hole No. CB-CH88-12

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT Canaveral Harbor	10. SIZE AND TYPE OF BIT see remarks
2. LOCATION (Coordinates or Station) x=622,415 y=1,481,953	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW
3. DRILLING AGENCY Corps of Engineers	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) CB-CH88-12	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER R. Gordon	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER Tidal
	16. DATE HOLE — STARTED 2 Aug 88 — COMPLETED 2 Aug 88
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE -23.4
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING 61% %
9. TOTAL DEPTH OF HOLE 22.0'	19. GEOLOGIST - J. Hand

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	[redacted] SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						Bit or Barrel
-23.4	0.0					-23.4 Blows/ft
			Silt, a trace of very fine quartz sand and shell, gray (MH)	70	1	settled
-26.4	3.0				2	2" Sampler
-27.4	4.0		Sand, very fine quartz, a trace of silt and shell, gray (SP)		3	
			Clay, gray (CH)			-30.4
				100	4	settled " -35.4 2
-36.4	13.0					3
			Shell, medium sand size, a little very fine quartz sand, a trace of silt, light gray	80	5	10 " 14 16 -40.4 26
				10	6	1 " 3 14
-44.4	21.0				7	10
-45.4	22.0		Sand, very fine quartz, slightly silty, light gray (SM)			-45.4 6

Hole No. CB-CH-88-13

DRILLING LOG	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 1 SHEETS

1. PROJECT
Canaveral Harbor

2. LOCATION (Coordinates or Station)
x=621,495 y=1,481,703

3. DRILLING AGENCY
Corps of Engineers

4. HOLE NO. (As shown on drawing title and file number) CB-CH88-13

5. NAME OF DRILLER
R. Gordon

6. DIRECTION OF HOLE
☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.

7. THICKNESS OF OVERBURDEN

8. DEPTH DRILLED INTO ROCK

9. TOTAL DEPTH OF HOLE 6.0'

10. SIZE AND TYPE OF BIT see remarks

11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
MLW

12. MANUFACTURER'S DESIGNATION OF DRILL
Failing 1500

13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED

14. TOTAL NUMBER CORE BOXES 1

15. ELEVATION GROUND WATER Tidal

16. DATE HOLE | STARTED 2 Sept 88 | COMPLETED 2 Sept 88

17. ELEVATION TOP OF HOLE -39.4

18. TOTAL CORE RECOVERY FOR BORING 70% %

19. GEOLOGIST - J. Hand

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	
						Bit or Barrel	
-39.4	0.0					-39.4	Blows/ft
			Sand, fine to medium shell, very fine quartz, a little silt to silty layers of silt, gray (SM)	70	1	—	settled
-42.4	3.0				2	2" Sampler	7 5
			Silt, very sandy, some shell, green (ML)				6
-45.4	6.0				3	-45.4	4

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT Canaveral Harbor | HOLE NO. CB-CH88-13

Hole No. CB-CH89-43

DRILLING LOG	DIVISION SOUTH ATLANTIC	INSTALLATION JACKSONVILLE DISTRICT	SHEET 1 OF 1 SHEETS

1. PROJECT CANAVERAL HARBOR	10. SIZE AND TYPE OF BIT SEE REMARKS
2. LOCATION (Coordinates or Station) X=631069 Y=1481700	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW
3. DRILLING AGENCY CORPS OF ENGINEERS	12. MANUFACTURER'S DESIGNATION OF DRILL S&H SKID RIG
4. HOLE NO. (As shown on drawing title and file number) CB-CH89-43	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER R. GORDON	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.	15. ELEVATION GROUND WATER TIDAL
	16. DATE HOLE — STARTED 2-14-89 — COMPLETED 2-14-89
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE -40.6
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING 47 %
9. TOTAL DEPTH OF HOLE 15.0'	19. SIGNATURE OF ~~INSPECTOR~~ GEOLOGIST J. GENTILE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						BIT OR BARREL
-40.6	0.0					-40.6 BLS/FT.
			SAND, fine quartz, clean, gray, wet (SP)	40	1	2" SAMPLER SETTLED 1 4 -45.6 3
-47.6	7.0			40	2	1 4
-49.1	8.5		SAND, fine quartz, clayey, dark gray, wet (SC)		3	1 6 -50.6 23
			Firm, damp, undisturbed, very fine quartz, gray-green from -49.1 to -55.6	60	4	2 4 12 22
-55.6	15.0					-55.6 30

SOILS ARE FIELD VISUALLY CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM

SAMPLE ELEVATION	LABORATORY CLASSIFICATION
-40.6 to -47.6	(SP-SM)
-50.6 to -55.6	(CL)

300# hammer with 18" drop used on 2" Sampler.

BLOWS COUNTS FOR THE 2" SAMPLER HAVE NOT BEEN COORELATED WITH STANDARD SPLIT-SPOON TESTS AS DESIGNATED IN ASTM D-1586. JUDGEMENT IS NEEDED IN THE USE OF THE BLOW COUNT DATA FOR THE 2" SAMPLER.

BLS/FT. REFERS TO THE NUMBER OF HAMMER BLOWS REQUIRED TO ADVANCE A 2" SAMPLER (2" I.D. X 2 ½" O.D.) ONE FOOT. THE SAMPLER IS 5 FT. LONG AND DRIVEN CONTINUOUSLY 5 FT. WHERE POSSIBLE.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.	PROJECT CANAVERAL HARBOR	HOLE NO. CB-CH89-43

Hole No. CB-CH89-44

DRILLING LOG	DIVISION SOUTH ATLANTIC	INSTALLATION JACKSONVILLE DISTRICT	SHEET OF 1 SHEETS
1. PROJECT CANAVERAL HARBOR		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) X=630079 Y=1481700		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW	
3. DRILLING AGENCY CORPS OF ENGINEERS		12. MANUFACTURER'S DESIGNATION OF DRILL S&H SKID RIG	
4. HOLE NO. (As shown on drawing title and file number) CB-CH89-44		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED | UNDISTURBED
5. NAME OF DRILLER W. GORDON		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.		15. ELEVATION GROUND WATER TIDAL	
		16. DATE HOLE	STARTED 2-13-89 | COMPLETED 2-13-89
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE -39.1	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING 35 %	
9. TOTAL DEPTH OF HOLE 8.7'		19. SIGNATURE OF ~~INSPECTOR~~ GEOLOGIST J. GENTILE	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						BIT OR BARREL
-39.1	0.0					-39.1 BLS/FT.
-41.1	2.0	▨	CLAY, plastic, trace to little sand, gray, wet, soupy (CH)			2" SAMPLER SETTLED
					1	
		▨	SAND, fine, quartz, little clay to clayey, gray, loose, wet (SC)	35	2	
-46.1	7.0				3	
-47.8	8.7	▨	CLAY, plastic, fat, undisturbed, gray, damp (CH)			-47.8

SOILS HAVE BEEN FIELD VISUALLY CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOILS CLASSIFICATION SYSTEM

SAMPLE ELEVATION	LABORATORY CLASSIFICATION
-39.1 to -41.1	(MH)*
-41.1 to -46.1	(SM)*
-46.1 to -47.8	(CH)*

NOTE

*VISUAL CLASSIFICATION BASED ON GRADATION CURVE. NO ATTERBERG LIMITS.

300# hammer with 18" drop used on 2" Sampler.

BLOWS COUNTS FOR THE 2" SAMPLER HAVE NOT BEEN COORELATED WITH STANDARD SPLIT-SPOON TESTS AS DESIGNATED IN ASTM D-1586. JUDGEMENT IS NEEDED IN THE USE OF THE BLOW COUNT DATA FOR THE 2" SAMPLER.

BLS/FT. REFERS TO THE NUMBER OF HAMMER BLOWS REQUIRED TO ADVANCE A 2" SAMPLER (2" I.D. X 2 ½" O.D.) ONE FOOT. THE SAMPLER IS 5 FT. LONG AND DRIVEN CONTINUOUSLY 5 FT. WHERE POSSIBLE.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT CANAVERAL HARBOR

HOLE NO. CB-CH89-44

Hole No. CB-CH89-45

DRILLING LOG	DIVISION SOUTH ATLANTIC	INSTALLATION JACKSONVILLE DISTRICT	SHEET 1 OF 1 SHEETS

1. PROJECT
CANAVERAL HARBOR

2. LOCATION (Coordinates or Station)
X=62907 Y=1481710

3. DRILLING AGENCY
CORPS OF ENGINEERS

4. HOLE NO. (As shown on drawing title and file number) CB-CH89-45

5. NAME OF DRILLER
R. GORDON

6. DIRECTION OF HOLE
☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.

7. THICKNESS OF OVERBURDEN

8. DEPTH DRILLED INTO ROCK

9. TOTAL DEPTH OF HOLE 6.5'

10. SIZE AND TYPE OF BIT SEE REMARKS

11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
MLW

12. MANUFACTURER'S DESIGNATION OF DRILL
S&H SKID RIG

13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED

14. TOTAL NUMBER CORE BOXES 1

15. ELEVATION GROUND WATER

16. DATE HOLE | STARTED 2-13-89 | COMPLETED 2-13-89

17. ELEVATION TOP OF HOLE -40.3

18. TOTAL CORE RECOVERY FOR BORING 77 %

19. SIGNATURE OF ~~INSPECTOR~~ XXXXXXX GEOLOGIST
J. GENTILE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
-40.3	0.0					BIT OR BARREL -40.3 BLS/FT.
-44.8	4.5	▨	CLAY, plastic,gray, wet from -40.3 to -44.8 (CH)	77	1	2" SAMPLER SETTLED
-46.8	6.5	▨	Undisturbed, fat (CH) from -44.8 to -46.8			-46.8
			SOILS HAVE BEEN FIELD VISUALLY CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOILS CLASSIFICATION SYSTEM			300# hammer with 18" drop used on 2" Sampler. BLOWS COUNTS FOR THE 2" SAMPLER HAVE NOT BEEN COORELATED WITH STANDARD SPLIT-SPOON TESTS AS DESIGNATED IN ASTM D-1586. JUDGEMENT IS NEEDED IN THE USE OF THE BLOW COUNT DATA FOR THE 2" SAMPLER. BLS/FT. REFERS TO THE NUMBER OF HAMMER BLOWS REQUIRED TO ADVANCE A 2" SAMPLER (2" I.D. X 2 ½ O.D.) ONE FOOT. THE SAMPLER IS 5 FT. LONG AND DRIVEN CONTINUOUSLY 5 FT. WHERE POSSIBLE.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT CANAVERAL HARBOR | HOLE NO. CB-CH89-45

Hole No. CB-CH89-46

DRILLING LOG	DIVISION SOUTH ATLANTIC	INSTALLATION JACKSONVILLE DISTRICT	SHEET 1 OF 1 SHEETS

1. PROJECT
CANAVERAL HARBOR
2. LOCATION (Coordinates or Station)
X=628096 Y=1481710
3. DRILLING AGENCY
CORPS OF ENGINEERS
4. HOLE NO. (As shown on drawing title and file number) CB-CH89-46
5. NAME OF DRILLER
R. GORDON
6. DIRECTION OF HOLE
☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 4.5
10. SIZE AND TYPE OF BIT SEE REMARKS
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
MLW
12. MANUFACTURER'S DESIGNATION OF DRILL
S&H SKID RIG
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES 1
15. ELEVATION GROUND WATER TIDAL
16. DATE HOLE | STARTED 2-10-89 | COMPLETED 2-10-89
17. ELEVATION TOP OF HOLE -40.8
18. TOTAL CORE RECOVERY FOR BORING 80 %
19. SIGNATURE OF ~~INSPECTOR~~ GEOLOGIST
J. GENTILE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						BIT OR BARREL
-40.8	0.0					-40.8 BLS/FT.
		▨	CLAY, plastic, fat, stiff, gray, (CH)	80	1	2" SAMPLER SETTLED
-45.3	4.5	▨				-45.3
			SOILS HAVE BEEN FIELD VISUALLY CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOILS CLASSIFICATION SYSTEM			300# hammer with 18" drop used on 2" Sampler. BLOWS COUNTS FOR THE 2" SAMPLER HAVE NOT BEEN COORELATED WITH STANDARD SPLIT-SPOON TESTS AS DESIGNATED IN ASTM D-1586. JUDGEMENT IS NEEDED IN THE USE OF THE BLOW COUNT DATA FOR THE 2" SAMPLER. BLS/FT. REFERS TO THE NUMBER OF HAMMER BLOWS REQUIRED TO ADVANCE A 2" SAMPLER (2" I.D. X 2 ½" O.D.) ONE FOOT. THE SAMPLER IS 5 FT. LONG AND DRIVEN CONTINUOUSLY 5 FT. WHERE POSSIBLE.

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE
MAR 71

PROJECT
CANAVERAL HARBOR

HOLE NO.
CB-CH89-46

Hole No. CB-CH89-47

DRILLING LOG

DIVISION: SOUTH ATLANTIC

INSTALLATION: JACKSONVILLE DISTRICT

SHEET 1 OF 1 SHEETS

1. PROJECT: CANAVERAL HARBOR
2. LOCATION (Coordinates or Station): X=627094 Y=1481680
3. DRILLING AGENCY: CORPS OF ENGINEERS
4. HOLE NO. (As shown on drawing title and file number): CB-CH89-47
5. NAME OF DRILLER: R. GORDON
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 5.0'
10. SIZE AND TYPE OF BIT: SEE REMARKS
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MLW
12. MANUFACTURER'S DESIGNATION OF DRILL: S&H SKID RIG
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES: 1
15. ELEVATION GROUND WATER: TIDAL
16. DATE HOLE: STARTED 2-10-89 | COMPLETED 2-10-89
17. ELEVATION TOP OF HOLE: -41.9
18. TOTAL CORE RECOVERY FOR BORING: 33 %
19. SIGNATURE OF [redacted] GEOLOGIST: J. GENTILE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	[redacted] NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						BIT OR BARREL
-41.9	0.0					-41.9 BLS/FT.
		▨	CLAY, plastic, fat, damp, gray, stiff (CH)	83	1	2" SAMPLER SETTLED
-46.9	5.0	▨				-46.9
			SOILS HAVE BEEN FIELD VISUALLY CLASSIFIED IN ACCORDANCE WITH THE UNIFIED CLASSIFICATION SYSTEM SAMPLE ELEVATION — LABORATORY CLASSIFICATION -41.9 to -46.9 (CH)* NOTE: *VISUAL CLASSIFICATION BASED ON GRADATION CURVE. NO ATTERBERG LIMITS.			300# hammer with 18" drop used on 2" Sampler. BLOWS COUNTS FOR THE 2" SAMPLER HAVE NOT BEEN COORELATED WITH STANDARD SPLIT-SPOON TESTS AS DESIGNATED IN ASTM D-1586. JUDGEMENT IS NEEDED IN THE USE OF THE BLOW COUNT DATA FOR THE 2" SAMPLER. BLS/FT. REFERS TO THE NUMBER OF HAMMER BLOWS REQUIRED TO ADVANCE A 2" SAMPLER (2" I.D. X 2½" O.D.) ONE FOOT. THE SAMPLER IS 5 FT. LONG AND DRIVEN CONTINUOUSLY 5 FT. WHERE POSSIBLE.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT: CANAVERAL HARBOR | HOLE NO. CB-CH89-47

Hole No. CB-CH89-48

DRILLING LOG	DIVISION SOUTH ATLANTIC	INSTALLATION JACKSONVILLE DISTRICT	SHEET 1 OF 1 SHEETS

1. PROJECT: CANAVERAL HARBOR
2. LOCATION (Coordinates or Station): X=626086 Y= 1,781,025
3. DRILLING AGENCY: CORPS OF ENGINEERS
4. HOLE NO. (As shown on drawing title and file number): CB-CH89-48
5. NAME OF DRILLER: R. GORDON
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 4.7'
10. SIZE AND TYPE OF BIT: SEE REMARKS
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MLW
12. MANUFACTURER'S DESIGNATION OF DRILL: S&H SKID RIG
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES: 1
15. ELEVATION GROUND WATER: TIDAL
16. DATE HOLE: STARTED 2-9-89 | COMPLETED 2-9-89
17. ELEVATION TOP OF HOLE: -39.8
18. TOTAL CORE RECOVERY FOR BORING: 100 %
19. SIGNATURE OF ~~INSPECTOR~~ XXXXXXX GEOLOGIST: J. GENTILE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						BIT OR BARREL
-39.8	0.0					WOH,R BLS/FT.
		▨	CLAY, plastic, gray, fat. (CH)			2" SAMPLER SETTLED
		▨		100	1	
-44.5	4.7	▨				***
			SOILS HAVE BEEN FIELD VISUALLY CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOILS CLASSIFICATION SYSTEM			300# hammer with 18" drop used on 2" Sampler.
			SAMPLE ELEVATION — LABORATORY CLASSIFICATION			BLOWS COUNTS FOR THE 2" SAMPLER HAVE NOT BEEN COORELATED WITH STANDARD SPLIT-SPOON TESTS AS DESIGNATED IN ASTM D-1586. JUDGEMENT IS NEEDED IN THE USE OF THE BLOW COUNT DATA FOR THE 2" SAMPLER.
			[illegible] (CH)			
			NOTE: *VISUAL CLASSIFICATION BASED ON [illegible], NO ATTERBERG LIMITS.			BLS/FT. REFERS TO THE NUMBER OF HAMMER BLOWS REQUIRED TO ADVANCE A 2" SAMPLER (2" I.D. X 2 1/2" O.D.) ONE FOOT. THE SAMPLER IS 5 FT. LONG AND DRIVEN CONTINUOUSLY 5 FT. WHERE POSSIBLE.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT: CANAVERAL HARBOR | HOLE NO. CB-CH89-48

Hole No. CB-CH89-49

DRILLING LOG	DIVISION SOUTH ATLANTIC	INSTALLATION JACKSONVILLE DISTRICT	SHEET 1 OF 1 SHEETS

1. PROJECT CANAVERAL HARBOR	10. SIZE AND TYPE OF BIT SEE REMARKS
2. LOCATION (Coordinates or Station) X=625066 Y=1481680	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW
3. DRILLING AGENCY CORPS OF ENGINEERS	12. MANUFACTURER'S DESIGNATION OF DRILL S&M SKID RIG
4. HOLE NO. (As shown on drawing title and file number) CB-CH89-49	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED
5. NAME OF DRILLER R. GORDON	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.	15. ELEVATION GROUND WATER TIDAL
	16. DATE HOLE STARTED 2-9-89 COMPLETED 2-9-89
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE -37.3
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 7.3'	19. SIGNATURE OF GEOLOGIST J. GENTILE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						BIT OR BARREL
-37.3	0.0					-37.3 BLS/FT.
		▨	CLAY, slightly plastic, black, wet, soft. (CL)	100	1	2" SAMPLER SETTLED
-41.3	4.0					
		▨	CLAY, plastic, stiff, fat, gray (CH)		2	-42.3 2
						1
-44.6	7.3			100	3	-44.6 1
						SETTLED
			SOILS HAVE BEEN FIELD VISUALLY CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOILS CLASSIFICATION SYSTEM			300# hammer with 18" drop used on 2" Sampler.
			SAMPLE ELEVATION / LABORATORY CLASSIFICATION -37.3 to -41.3 (MH)* NOTE: *VISUAL CLASSIFICATION BASED ON GRADATION CURVE. NO ATTERBERG LIMITS.			BLOWS COUNTS FOR THE 2" SAMPLER HAVE NOT BEEN COORELATED WITH STANDARD SPLIT-SPOON TESTS AS DESIGNATED IN ASTM D-1586. JUDGEMENT IS NEEDED IN THE USE OF THE BLOW COUNT DATA FOR THE 2" SAMPLER. BLS/FT. REFERS TO THE NUMBER OF HAMMER BLOWS REQUIRED TO ADVANCE A 2" SAMPLER (2" I.D. X 2 ½" O.D.) ONE FOOT. THE SAMPLER IS 5 FT. LONG AND DRIVEN CONTINUOUSLY 5 FT. WHERE POSSIBLE.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT CANAVERAL HARBOR | HOLE NO. CB-CH89-49

Hole No. CB-CH89-50

DRILLING LOG	DIVISION SOUTH ATLANTIC	INSTALLATION JACKSONVILLE DISTRICT	SHEET 1 OF 1 SHEETS

1. PROJECT CANAVERAL HARBOR	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station) X=6[illegible]94 Y=1482377	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW
3. DRILLING AGENCY CORPS OF ENGINEERS	12. MANUFACTURER'S DESIGNATION OF DRILL S&H SKID RIG
4. HOLE NO. (As shown on drawing title and file number) CB-CH89-50	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN DISTURBED UNDISTURBED
5. NAME OF DRILLER R. GORDON	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.	15. ELEVATION GROUND WATER TIDAL
	16. DATE HOLE STARTED 2-14-89 COMPLETED 2-14-89
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE -33.3
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING 93 %
9. TOTAL DEPTH OF HOLE 13.5'	19. SIGNATURE OF ~~INSPECTOR~~ GEOLOGIST J. GENTILE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
-33.3	0.0					BIT OR BARREL -33.3 BLS/FT.
-38.8	5.5	▨	CLAY, soupy, wet, disturbed, gray (CH)	85	1	2" SAMPLER SETTLED -39.3
		▨	Undisturbed, fat, gray (CH), from -38.8 to -46.8	100	2	SETTLED -44.3 3
-46.8	13.5	▨		100	3	SETTLED -46.8
			SOILS ARE FIELD VISUALLY CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOILS CLASSIFICATION SYSTEM			300# hammer with 18" drop used on 2" Sampler.

SAMPLE ELEVATION	LABORATORY CLASSIFICATION
-33.3 to -38.8	(MH)*

NOTE:
*VISUAL CLASSIFICATION BASED ON GRADATION CURVE. NO ATTERBERG LIMITS.

BLOW COUNTS FOR THE 2" SAMPLER HAVE NOT BEEN COORELATED WITH STANDARD SPLIT-SPOON TESTS AS DESIGNATED IN ASTM D-1586. JUDGEMENT IS NEEDED IN THE USE OF THE BLOW COUNT DATA FOR THE 2" SAMPLER.

BLS/FT. REFERS TO THE NUMBER OF HAMMER BLOWS REQUIRED TO ADVANCE A 2" SAMPLER (2" I.D. X 2 ½" O.D.) ONE FOOT. THE SAMPLER IS 5 FT. LONG AND DRIVEN CONTINUOUSLY 5 FT. WHERE POSSIBLE.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT CANAVERAL HARBOR | HOLE NO. CB-CH89-50

Hole No. CB-CH89-51

DRILLING LOG	DIVISION SOUTH ATLANTIC	INSTALLATION JACKSONVILLE DISTRICT	SHEET 1 OF 1 SHEETS

1. PROJECT CANAVERAL HARBOR	10. SIZE AND TYPE OF BIT SEE REMARKS
	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW
2. LOCATION (Coordinates or Station) X=626126 Y=1482710	12. MANUFACTURER'S DESIGNATION OF DRILL S&H SKID RIG
3. DRILLING AGENCY CORPS OF ENGINEERS	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
4. HOLE NO. (As shown on drawing title and file number) CB-CH89-51	14. TOTAL NUMBER CORE BOXES 1
5. NAME OF DRILLER R. GORDON	15. ELEVATION GROUND WATER TIDAL
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	16. DATE HOLE: STARTED 2-14-89 COMPLETED 2-14-89
	17. ELEVATION TOP OF HOLE -34.4
7. THICKNESS OF OVERBURDEN	18. TOTAL CORE RECOVERY FOR BORING 96 %
8. DEPTH DRILLED INTO ROCK	19. SIGNATURE OF INSPECTOR GEOLOGIST U. GENTILE
9. TOTAL DEPTH OF HOLE 12.5	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						BIT OR BARREL
-34.4	0.0					-34.4 BLS/FT.
			CLAY, black to dark gray, plastic, wet. (CH)	90	2	2" SAMPLER SETTLED 1 2
-38.4	4.0					
-38.9	4.5		SAND, fine to medium, quartz, some shell, lt gray, little clay. (SC)			SETTLED
			CLAY, plastic, fat, hard, undisturbed, gray. (CH)	100	3	1 2 3
-44.4	10.0					
			little silt & sand, from -42.9 to -46.9.	100	4	SETTLED
-46.9	12.5					-46.9

SOILS ARE FIELD VISUALLY CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOILS CLASSIFICATION SYSTEM.

300# hammer with 18" drop used on 2" Sampler.

BLOW COUNTS FOR THE 2" SAMPLER HAVE NOT BEEN CORRELATED WITH STANDARD SPLIT-SPOON TESTS AS DESIGNATED IN ASTM D-1586. JUDGEMENT IS NEEDED IN THE USE OF THE BLOW COUNT DATA FOR THE 2" SAMPLER.

BLS/FT. REFERS TO THE NUMBER OF HAMMER BLOWS REQUIRED TO ADVANCE A 2" SAMPLER (2" I.D. X 2.5" O.D.) ONE FOOT. THE SAMPLER IS 5 FT. LONG AND DRIVEN CONTINUOUSLY 5 FT. WHERE POSSIBLE.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT CANAVERAL HARBOR

HOLE NO. CB-CH89-51

Hole No. CB-CH89-52

DRILLING LOG	DIVISION SOUTH ATLANTIC	INSTALLATION JACKSONVILLE DISTRICT	SHEET OF 1 SHEETS

1. PROJECT
CANAVERAL HARBOR
2. LOCATION (Coordinates or Station)
[illegible]
3. DRILLING AGENCY
CORPS OF ENGINEERS
4. HOLE NO. (As shown on drawing title and file number) [illegible]
5. NAME OF DRILLER
[illegible]
6. DIRECTION OF HOLE
☐ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT SEE REMARKS
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
MLW
12. MANUFACTURER'S DESIGNATION OF DRILL
[illegible] SKID RIG
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER TIDAL
16. DATE HOLE | STARTED [illegible]-14-89 | COMPLETED [illegible]-14-89
17. ELEVATION TOP OF HOLE -[illegible]
18. TOTAL CORE RECOVERY FOR BORING — %
19. SIGNATURE OF INSPECTOR GEOLOGIST
[illegible]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						BIT OX BARREL
						-[illegible] BLS/FT.
		▨	[illegible]			2" SAMPLER [illegible]
[illegible]		▨	[illegible]			
[illegible]		▨				-[illegible]
			[illegible] NOTE: [illegible] CLASSIFICATION BASED ON GRADATION CURVE [illegible]			[illegible] BLOW COUNTS FOR THE 2" SAMPLER HAVE NOT BEEN CORRELATED WITH STANDARD PENETRATION TESTS AS DESCRIBED IN ASTM MANUAL. JUDGEMENT IS NEEDED IN THE USE OF THE BLOW COUNT DATA FOR THE 2" SAMPLER. MOBILITY FACTOR IS THE NUMBER OF HAMMER BLOWS REQUIRED TO ADVANCE A 2" SAMPLER (2" I.D. & [illegible] O.D.) ONE FOOT. THE SAMPLER IS 5 FT. LONG AND DRIVEN CONTINUOUSLY 5 FT. WHERE POSSIBLE.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT CANAVERAL HARBOR 89 | HOLE NO. CB-CH89-52

Hole No. CB-CH89-53

DRILLING LOG	DIVISION SOUTH ATLANTIC	INSTALLATION JACKSONVILLE DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT CANAVERAL HARBOR		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) X=624010 Y=1481800		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW	
3. DRILLING AGENCY CORPS OF ENGINEERS		12. MANUFACTURER'S DESIGNATION OF DRILL S&H SKID RIG	
4. HOLE NO. (As shown on drawing title and file number)	CB-CH89-53	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED | UNDISTURBED
5. NAME OF DRILLER R. GORDON		14. TOTAL NUMBER CORE BOXES 1	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ________ DEG. FROM VERT.		15. ELEVATION GROUND WATER TIDAL	
		16. DATE HOLE	STARTED 2-15-89 | COMPLETED 2-15-89
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE -35.7	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING 91 %	
9. TOTAL DEPTH OF HOLE 11.0'		19. SIGNATURE OF ~~INSPECTOR~~ XXXXXXXX GEOLOGIST J. GENTILE	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
-35.7	0.0					BIT OR BARREL -35.7 BLS/FT.
-42.2	6.5	▨	CLAY, plastic, fat, damp, undisturbed, gray (CH)	83	1	2.0" SAMPLER SETTLED -41.7
-44.7	9.0	▤	SILT, sandy, organic stain, dark brown, trace clay, SL plastic (ML)	100	2	SETTLED 3
-46.7	11.0	▩	SAND, fine, quartz, clayey, gray-green, little shell wet, limestone lenses from -44.7 to 45.7 (SC)		3	6 -46.7 12

SOILS HAVE BEEN FIELD VISUALLY CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOILS CLASSIFICATION SYSTEM

SAMPLE ELEVATION	LABORATORY CLASSIFICATION
-35.7 to -42.2	(CH)*
-42.2 to -44.7	(CH)*
-44.7 to -46.7	(ML)*

NOTE:
*VISUAL CLASSIFICATION BASED ON GRADATION CURVE. NO ATTERBERG LIMITS.

300# hammer with 18" drop used on 2" Sampler.

BLOW COUNTS FOR THE 2" SAMPLER HAVE NOT BEEN COORELATED WITH STANDARD SPLIT-SPOON TESTS AS DESIGNATED IN ASTM D-1586. JUDGEMENT IS NEEDED IN THE USE OF THE BLOW COUNT DATA FOR THE 2" SAMPLER.

BLS/FT. REFERS TO THE NUMBER OF HAMMER BLOWS REQUIRED TO ADVANCE A 2" SAMPLER (2" I.D. X 2 ½" O.D.) ONE FOOT. THE SAMPLER IS 5 FT. LONG AND DRIVEN CONTINUOUSLY 5 FT. WHERE POSSIBLE.

Hole No. CB-CH89-54

DRILLING LOG	DIVISION SOUTH ATLANTIC	INSTALLATION JACKSONVILLE DISTRICT
SHEET 1 OF 1 SHEETS		

1. PROJECT CANAVERAL HARBOR
2. LOCATION (Coordinates or Station) X=623008 Y=1481762
3. DRILLING AGENCY CORPS OF ENGINEERS
4. HOLE NO. (As shown on drawing title and file number) CB-CH89-54
5. NAME OF DRILLER R. GORDON
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 11.5'
10. SIZE AND TYPE OF BIT SEE REMARKS
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW
12. MANUFACTURER'S DESIGNATION OF DRILL S&H SKID RIG
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES 1
15. ELEVATION GROUND WATER TIDAL
16. DATE HOLE | STARTED 2-15-89 | COMPLETED 2-15-89
17. ELEVATION TOP OF HOLE -36.2
18. TOTAL CORE RECOVERY FOR BORING 73 %
19. SIGNATURE OF ~~INSPECTOR~~ GEOLOGIST J. GENTILE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
-35.6	0.0					BIT OR BARREL -36.6 BLS/FT.
-42.7	6.5	▨	CLAY, plastic, wet, soupy, disturbed, gray, sandy, with clayey sand seams, (CH)	46	1	SETTLED 2" SAMPLER -42.7
-47.7	11.5	▨	SAND, fine, quartz, clayey, wet, gray (SC) very shelly from -42.7 to -43.7 Some shell, gray, wet, fine quartz, from -43.7 to -47.7	100	2	7 3 1 1 4 -47.7
			Soils are field visually classified in accordance with the Unified Soils Classification System.			200# hammer with 18" drop used on 2" Sampler. BLOW COUNTS FOR THE 2" SAMPLER HAVE NOT BEEN COORELATED WITH STANDARD SPLIT-SPOON TESTS AS DESIGNATED IN ASTM D-1586. JUDGEMENT IS NEEDED IN THE USE OF THE 2" SAMPLER. BLS/FT. REFERS TO THE NUMBER OF HAMMER BLOWS REQUIRED TO ADVANCE A 2" SAMPLER (2" I.D. X 2 ½" O.D.) ONE FOOT. THE SAMPLER IS 5 FT. LONG AND DRIVEN CONTINUOUSLY 5 FT. WHERE POSSIBLE.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT CANAVERAL HARBOR

HOLE NO. CB-CH8954

Hole No. CB-CH89-55

DRILLING LOG	DIVISION SOUTH ATLANTIC	INSTALLATION JACKSONVILLE DISTRICT	SHEET 1 OF 1 SHEETS

1. PROJECT CANAVERAL HARBOR
2. LOCATION (Coordinates or Station) X=522015 Y=1481741
3. DRILLING AGENCY CORPS OF ENGINEERS
4. HOLE NO. (As shown on drawing title and file number) CB-CH89-55
5. NAME OF DRILLER R. GORDON
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE 10.0'
10. SIZE AND TYPE OF BIT SEE REMARKS
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLW
12. MANUFACTURER'S DESIGNATION OF DRILL S&H SKID RIG
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN DISTURBED UNDISTURBED
14. TOTAL NUMBER CORE BOXES 1
15. ELEVATION GROUND WATER TIDAL
16. DATE HOLE STARTED 2-15-89 COMPLETED 2-15-89
17. ELEVATION TOP OF HOLE -37.0
18. TOTAL CORE RECOVERY FOR BORING 100 %
19. SIGNATURE OF ~~XXXXXXXX~~ GEOLOGIST J. GENTILE

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						BIT OR BARREL
-37.0	0.0					-37.0 BLS/FT.
-40.0	3.0		SILT, sandy, gray, wet soupy, seams silty sand, (ML) little shell	100	1 2	2" SAMPLER SETTLED 1
-41.0	4.0		SHELL, sand size shell fragments silty, wet gray		3	6
-42.5	5.5		SAND, fine, quartz, some clay, little shell, lt gray (SC)			-42.0 10 SETTLED
-47.0	10.0		SILT, undisturbed, trace shell, gray-green, damp, (ML)	100	4	1 -47.0 2

SOILS HAVE BEEN FIELD VISUALLY CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOILS CLASSIFICATION SYSTEM

SAMPLE ELEVATION	LABORATORY CLASSIFICATION
-37.0 TO -40.0	(SC)*
-40.0 TO -41.0	(SP)*
-41.0 TO -42.5	(SM)*
-42.5 TO -47.0	(CL)*

NOTE:
*VISUAL CLASSIFICATION BASED ON GRADATION CURVE. NO ATTERBERG LIMITS.

300* hammer with 18" drop used on 2" Sampler.

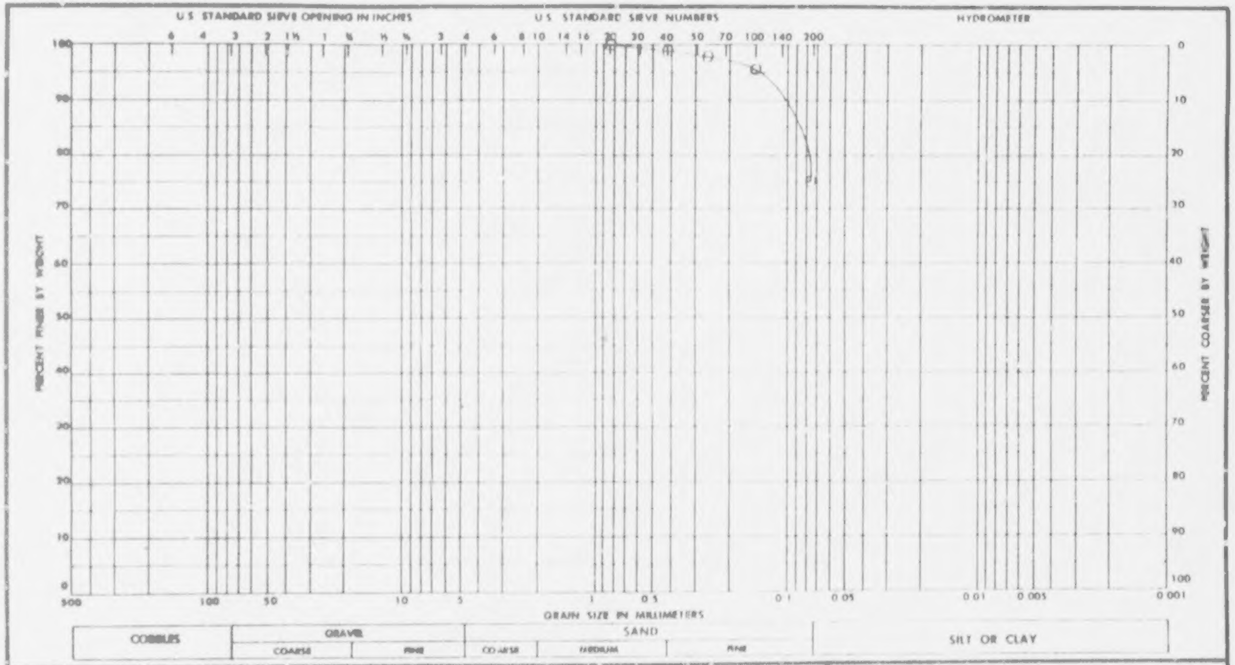
BLOW COUNTS FOR THE 2" SAMPLER HAVE NOT BEEN COORELATED WITH STANDARD SPLIT-SPOON TESTS AS DESIGNATED IN ASTM D-1586. JUDGEMENT IS NEEDED IN THE USE OF THE BLOW COUNT DATA FOR THE 2" SAMPLER.

BLS/FT. REFERS TO THE NUMBER OF HAMMER BLOWS REQUIRED TO ADVANCE A 2" SAMPLER (2" I.D. X 2 *" O.D.) ONE FOOT. THE SAMPLER IS 5 FT. LONG AND DRIVEN CONTINUOUSLY 5 FT. WHERE POSSIBLE.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT CANAVERAL HARBOR | HOLE NO. CB-CH89-55

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA 30060

WO No 5701
Req No RM-CW-89-0002



Sample No.	Elev or XXXXX	VISUAL Classification	Nat w %	LL	PL	PI
—	-40 8/-42.8	INORGANIC SILT HIGH LL (MH) GRAY, CLAYEY, WITH SOME SAND AND A TRACE OF MICA AND ORGANIC MATTER. SPECIFIC GRAVITY = 2.62	—	—		

Project CANAVERAL HARBOR CHANNEL

Area LAB NO. 73/3322 *

Boring No CB CH88-8 SAMPLE

Date 11/10/88

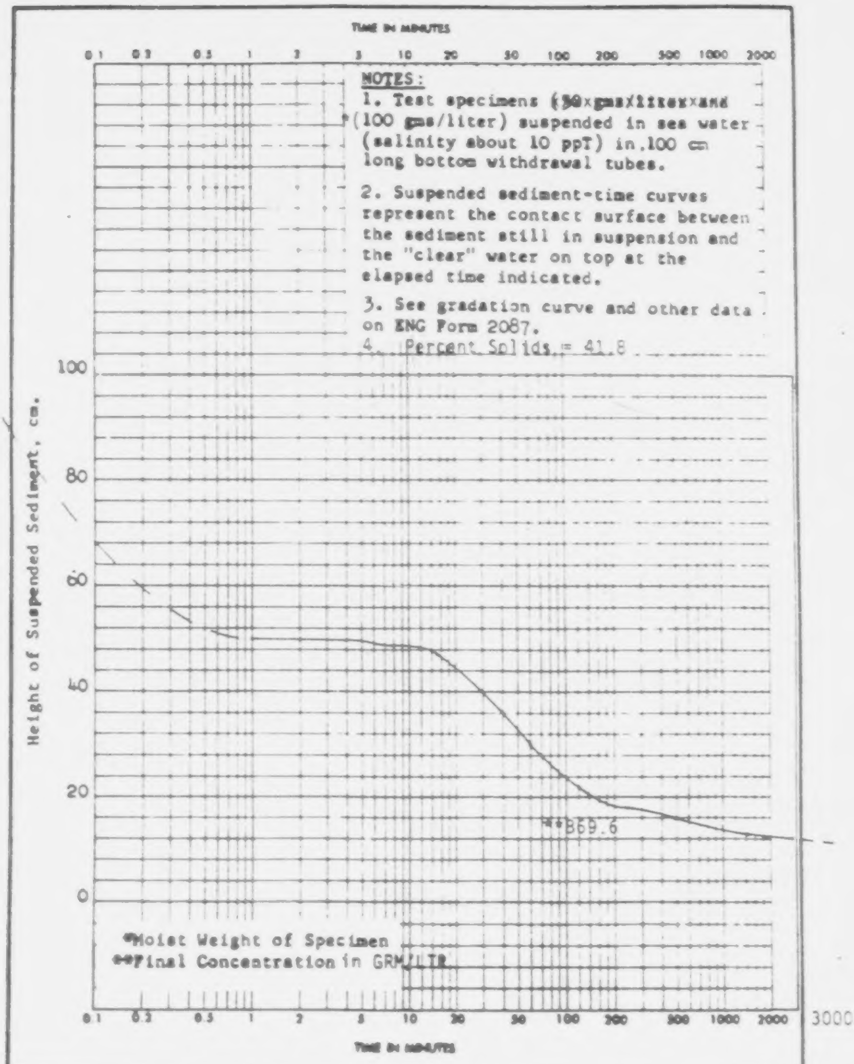
GRADATION CURVES

ENG FORM 1 MAY 63 2087

*See sedimentation rate time curve on SAD Form 3023

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY,
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GEORGIA 30061

Reqn. No. RM-CW-89-0002
Work Order No. 5701



NOTES:

1. Test specimens ~~(50 gms/liter and~~ *(100 gms/liter) suspended in sea water (salinity about 10 ppT) in 100 cm long bottom withdrawal tubes.

2. Suspended sediment-time curves represent the contact surface between the sediment still in suspension and the "clear" water on top at the elapsed time indicated.

3. See gradation curve and other data on ENG Form 2087.

4. Percent Solids = 41.8

*Moist Weight of Specimen
**Final Concentration in GRM/LTR

PROJECT Canaveral Harbor Channel

AREA Lab No. 73/3322

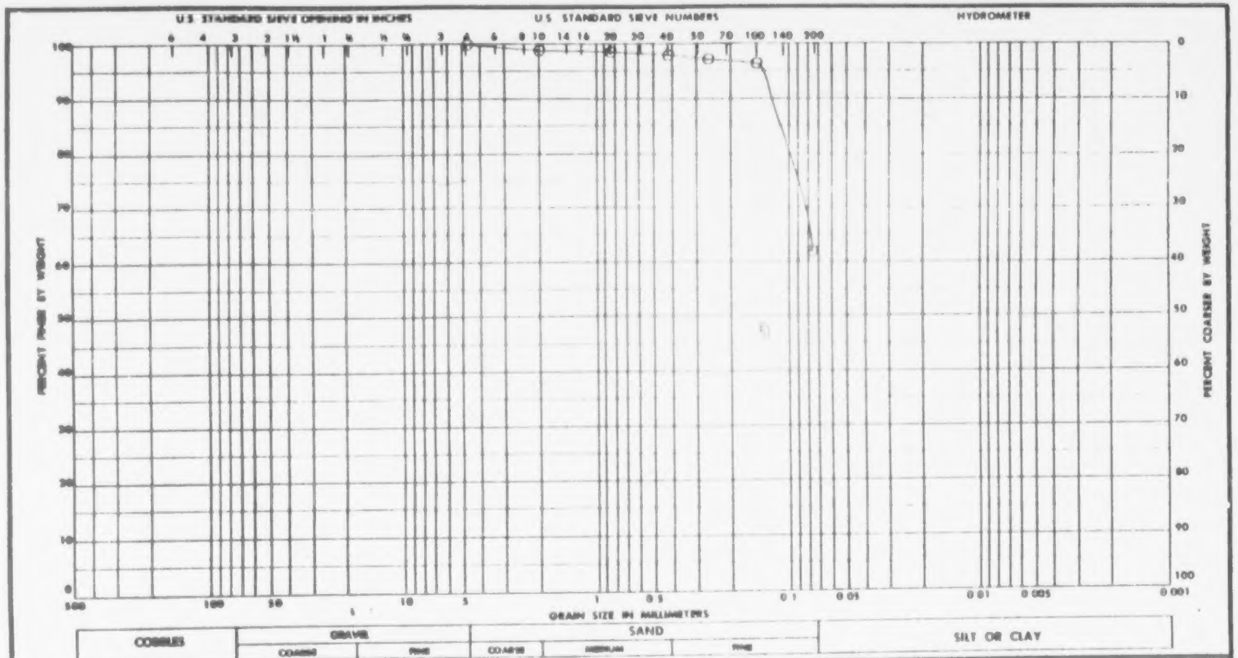
BORING NO. CB-CH88-8 | SAMPLE NO -- | DEPTH EL. -40.8/-42.8 | DATE 15 Nov 88

SUSPENDED SEDIMENT-TIME CURVES (TRANSLUCENT)

SAD Form 3023

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA 30060

WO No 5701
Req No RM-CW-89-0002



Sample No.	Elev or Depth	VISUAL Classification	Nat w %	LL	PL	PI
--	-47.8/-48.8	INORGANIC SILT HIGH LL (MH) GRAY, SANDY, WITH A TRACE OF ORGANIC MATTER AND MICA. SPECIFIC GRAVITY = 2.67	--	--	--	

Project CANAVERAL HARBOR CHANNEL

Area LAB NO. 73/3323*

Boring No CB-CH88-8 SAMPLE -

Date 11/10/88

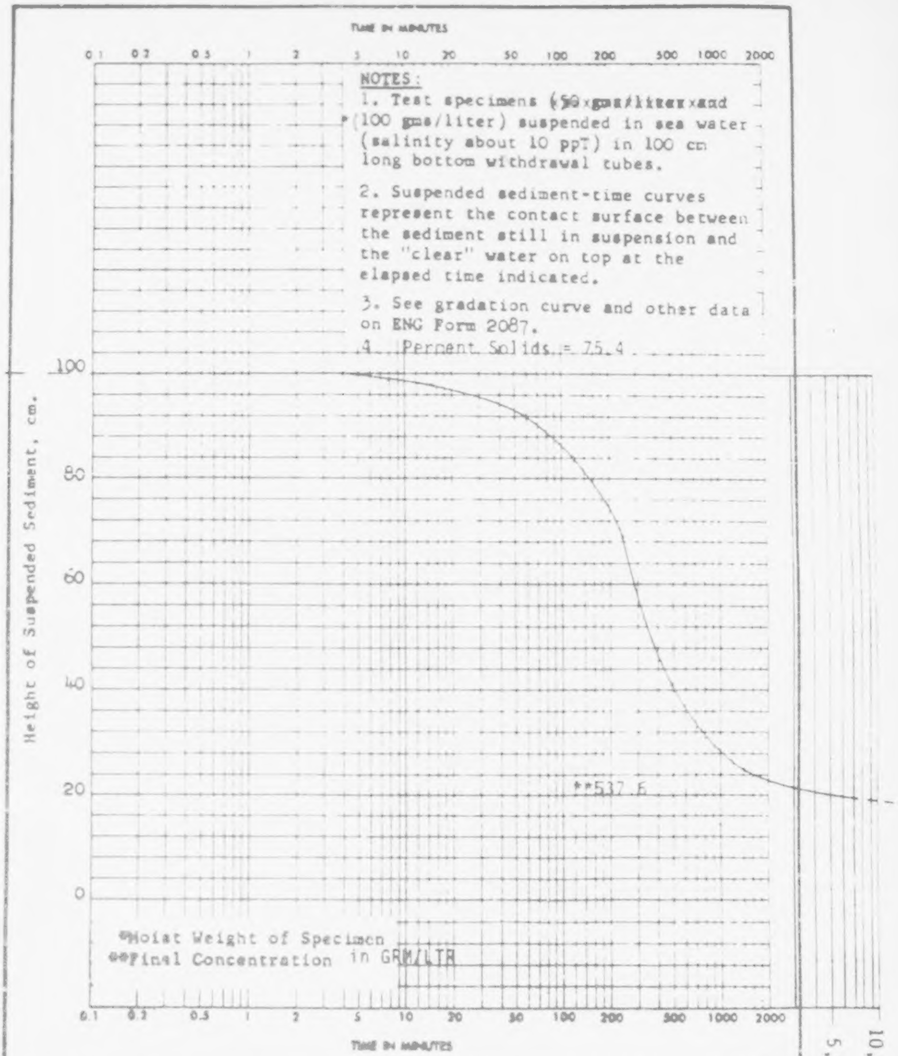
GRADATION CURVES

ENG FORM 1 MAY 63 2087

*See sedimentation rate time curve on SAD Form 3023

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY,
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GEORGIA 30061

Reqn. No. RM-CW-89-0002
Work Order No. 5701



NOTES:

1. Test specimens ~~(50 gms/liter and~~ *(100 gms/liter) suspended in sea water (salinity about 10 ppT) in 100 cm long bottom withdrawal tubes.

2. Suspended sediment-time curves represent the contact surface between the sediment still in suspension and the "clear" water on top at the elapsed time indicated.

3. See gradation curve and other data on ENG Form 2087.

4. Percent Solids = 75.4

*Moist Weight of Specimen
**Final Concentration in GRM/LTR

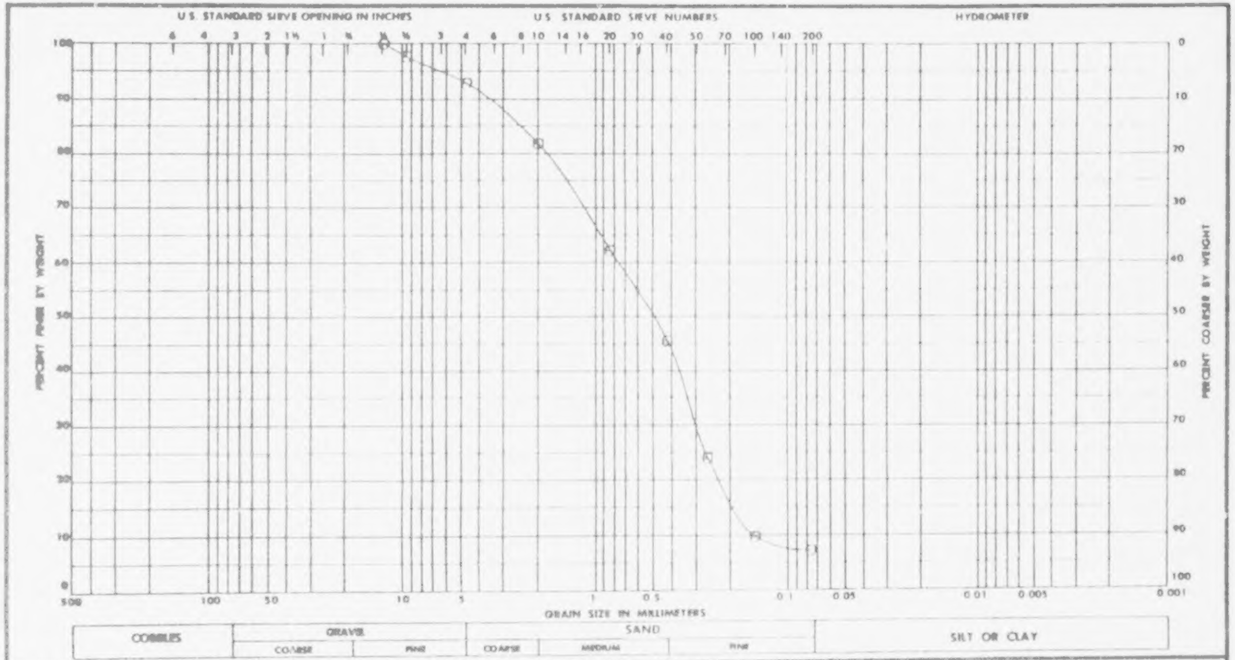
PROJECT Canaveral Harbor Channel			
AREA Lab. No. 73/3323			
BORING NO. CB-CH88-8	SAMPLE NO --	DEPTH EL -47.8/-48.8	DATE 15 Nov 88
SUSPENDED SEDIMENT-TIME CURVES			(TRANSLUCENT)

SAD Form 3023

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA 30060

W O No 5701

Req No RM-CW-89-0002



Sample No.	Elev or	Classification	Nat w %	LL	PL	PI
--	-41.4/-46.4	VISUAL POOR GRD SILTY SAND (SP-SM) GRAY, WITH A LITTLE CEMENTED LIMESTONE AND SHELL FRAGMENTS SPECIFIC GRAVITY = 2.68	--	NP	NP	NP

Project CANAVERAL HARBOR CHANNEL

Area LAB NO 73/3324*

Boring No CB-CHB8-11 SAMPLE

Date 11/10/88

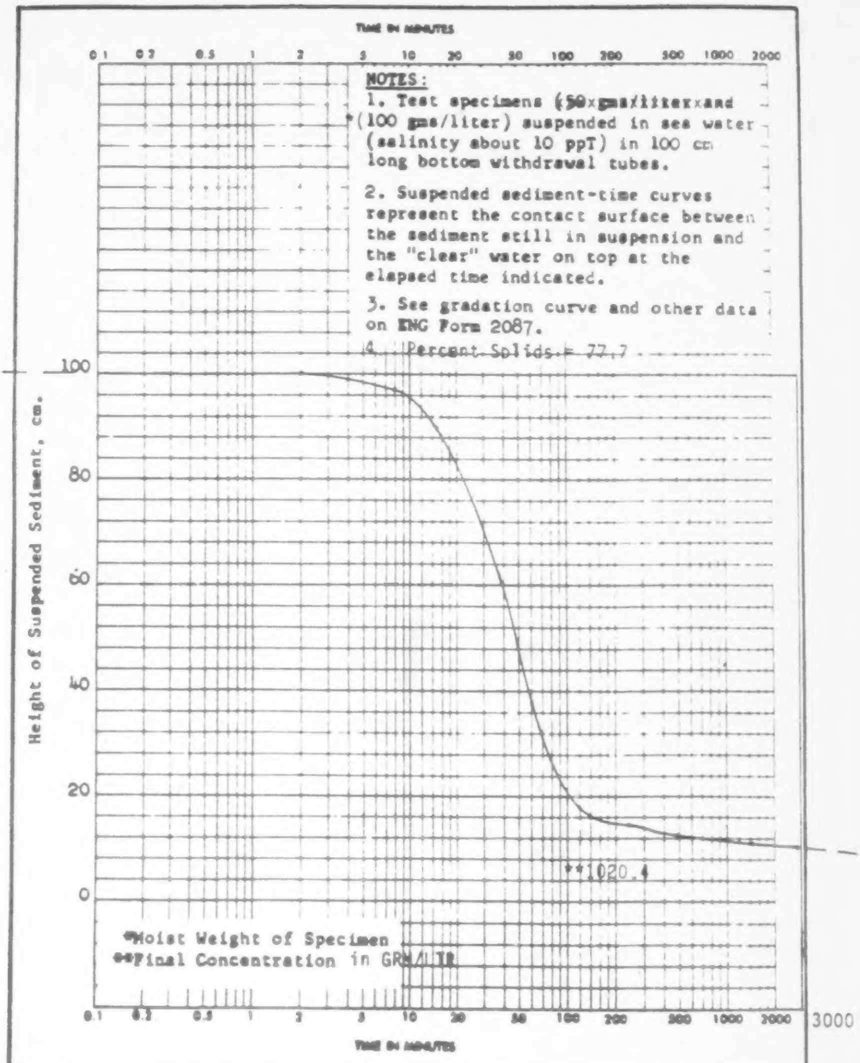
GRADATION CURVES

ENG FORM 1 MAY 63 2087

*See sedimentation rate time curve on SAD Form 3023

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY,
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GEORGIA 30061

Work Order No. 5701



NOTES:

1. Test specimens ~~(50 gms/liter and~~ *(100 gms/liter) suspended in sea water (salinity about 10 ppT) in 100 cm long bottom withdrawal tubes.

2. Suspended sediment-time curves represent the contact surface between the sediment still in suspension and the "clear" water on top at the elapsed time indicated.

3. See gradation curve and other data on ENG Form 2087.

4. Percent Solids = 77.7

*Moist Weight of Specimen
**Final Concentration in GRM/LITR

PROJECT Canaveral Harbor Channel

AREA Lab No. 73/3324

BORING NO. CB-CH88-11	SAMPLE NO. --	DEPTH X EL. -41.4/-46.4	DATE 15 Nov 88

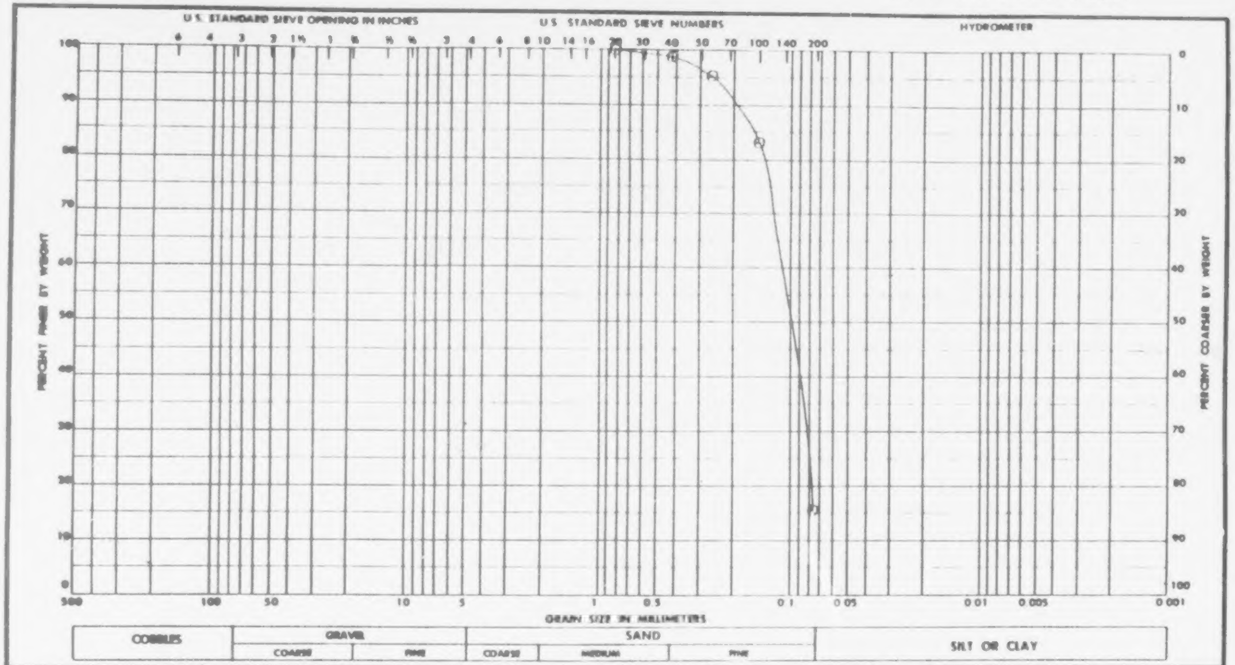
SUSPENDED SEDIMENT-TIME CURVES (TRANSLUCENT)

SAD Form 3023
24 Oct 72

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA 30060

W.O. No 5701

Req No RM-CW-89-0002



Sample No.	Elev or ~~Depth~~	VISUAL Classification	Nat w %	LL	PL	PI
--	-26.4/-27.4	SILTY SAND (SM) GRAY, WITH A TRACE OF ORGANIC MATTER, SHELL, AND MICA. SPECIFIC GRAVITY = 2.72	--	NP	NP	NP

Project CANAVERAL HARBOR CHANNEL

Area LAB NO. 73/3325 *

Boring No. CB-CH88-12 , SAMPLE --

Date 11/10/88

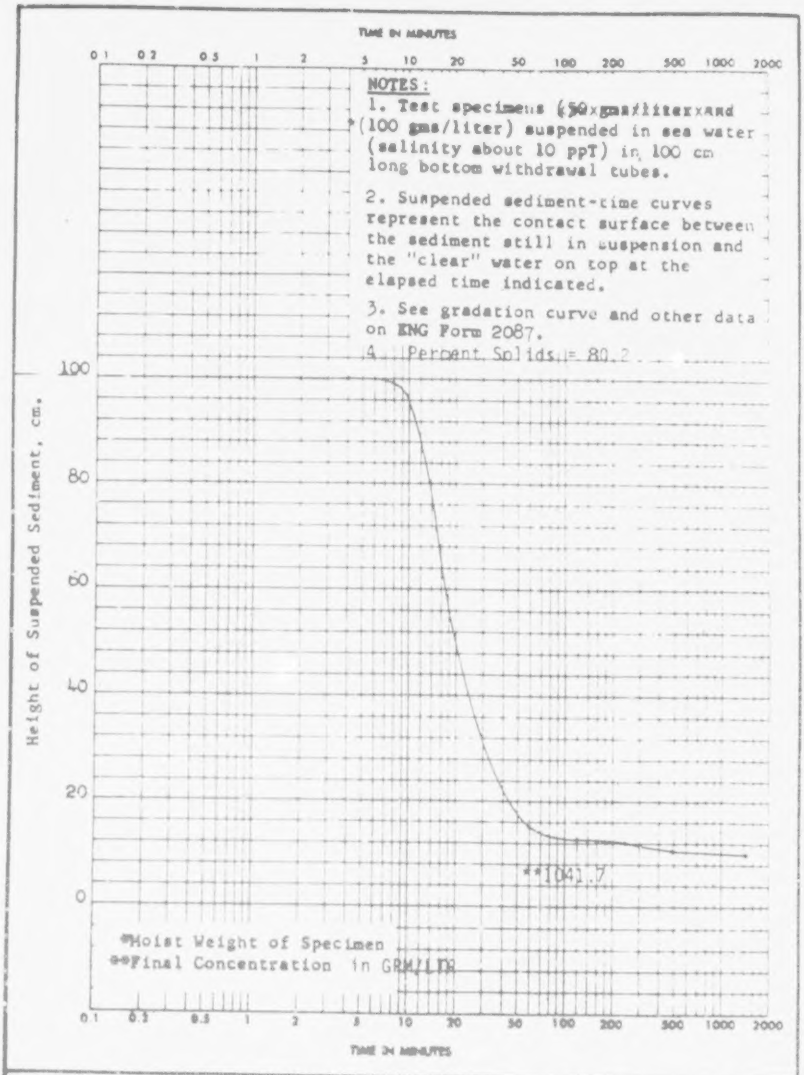
GRADATION CURVES

ENG FORM 1 MAY 63 2087

*See sedimentation rate time curve on SAD Form 3023

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY,
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GEORGIA 30061

Reqn. No. RM-CW-89-0002
Work Order No. 5701



NOTES:

1. Test specimens (~~50 gms/liter and~~ *(100 gms/liter) suspended in sea water (salinity about 10 ppT) in 100 cm long bottom withdrawal tubes.

2. Suspended sediment-time curves represent the contact surface between the sediment still in suspension and the "clear" water on top at the elapsed time indicated.

3. See gradation curve and other data on ENG Form 2087.

4. Percent Solids = 80.2

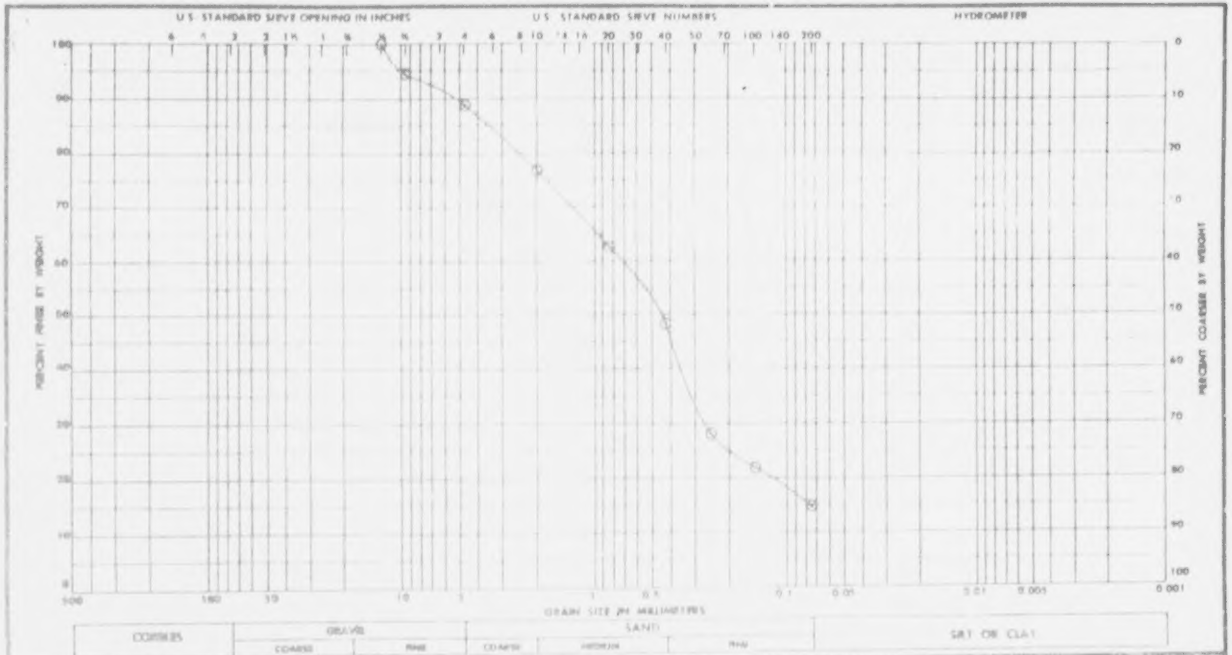
PROJECT Canaveral Harbor Channel			
AREA Lab No. 73/3325			
BORING NO. CB-CH88-12	SAMPLE NO. --	DEPTH/ EL -26.4/-27.4	DATE 15 Nov 88

SUSPENDED SEDIMENT-TIME CURVES (TRANSLUCENT)

SAD Form 3023

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA 30060

W.O. No 5701
Req No RM-CW-89-0002



Sample No.	Elev or Depth	Visual Classification	Nat w %	LL	PL	PI
--	-39.4/-41.0	GRAY CLAYEY SAND AND GRAVEL SIZE SHELL (SC),WITH SOME SAND AND A TRACE OF MICA. SPECIFIC GRAVITY : 2.74	--	--	--	--

Project CANAVERAL HARBOR CHANNEL

Area LAB NO. 73/3326*

Boring No CB-CH88-13 , SAMPLE NO.--

Date 11/10/88

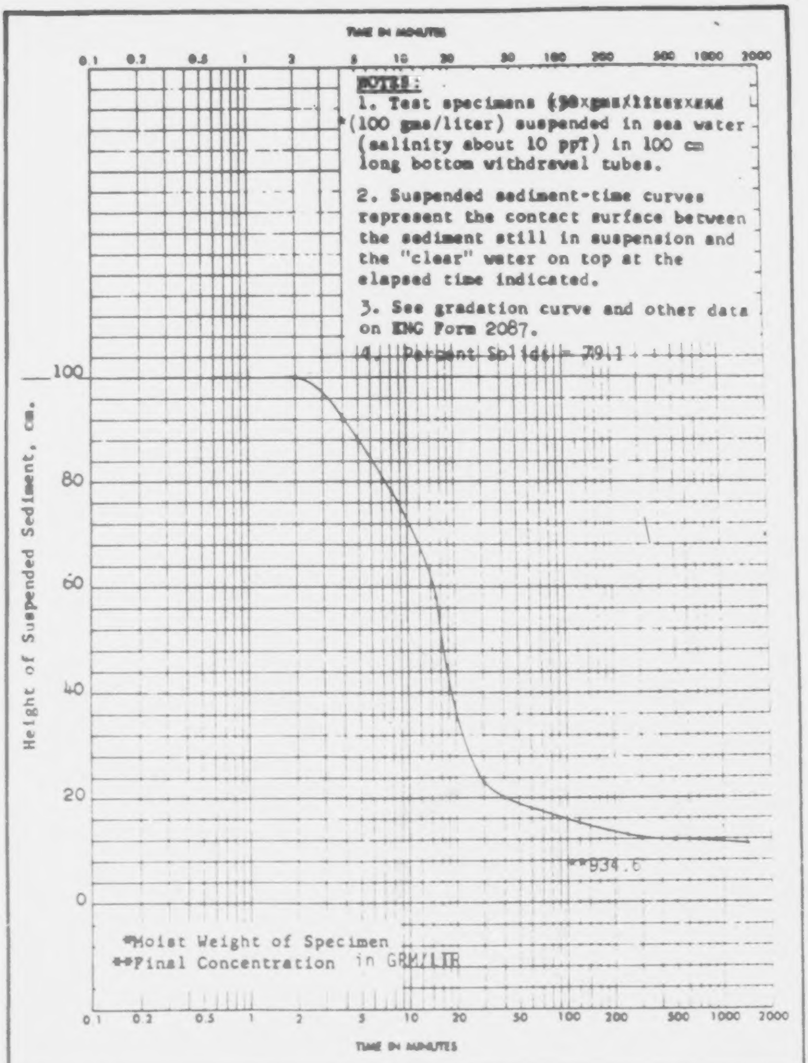
GRADATION CURVES

ENG FORM 1 MAY 63 2087

*See sedimentation rate time curve on SAD Form 3023

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY,
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GEORGIA 30061

Reqn. No. RM-CW-89-0002
Work Order No. 5701



NOTES:

1. Test specimens ~~(90 gms/liter and~~ *(100 gms/liter) suspended in sea water (salinity about 10 ppT) in 100 cm long bottom withdrawal tubes.

2. Suspended sediment-time curves represent the contact surface between the sediment still in suspension and the "clear" water on top at the elapsed time indicated.

3. See gradation curve and other data on ENG Form 2087.

4. Percent Solids = 79.1

PROJECT Canaveral Harbor Channel			
~~XXXXX~~ Lab No. 73/3326			
BORING NO CB-CH88-13	SAMPLE NO --	DEPTH/EL -39.4/-41.0	DATE 15 Nov 88

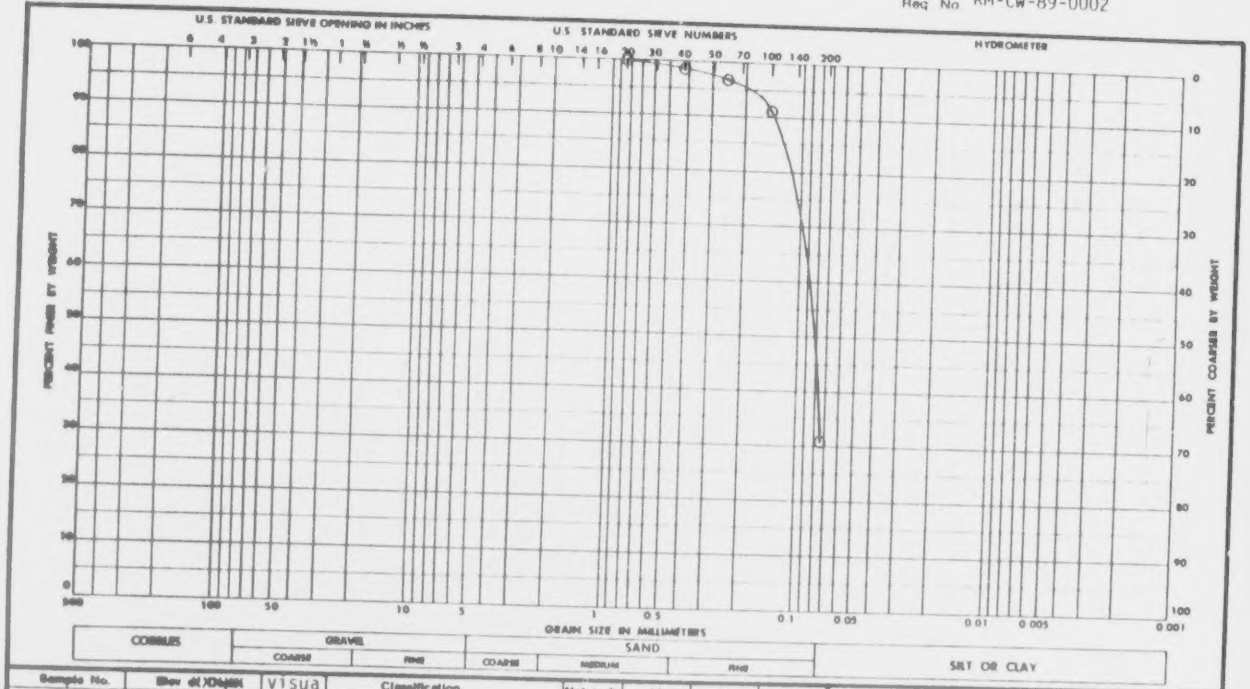
SUSPENDED SEDIMENT-TIME CURVES (TRANSLUCENT)

SAD Form 3023
26 Oct 72

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA. 30060

W O No 5701

Req No RM-CW-89-0002



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
--	-41.7/-45.4	visual SILTY SAND HIGH LL (SM-H) GRAY, WITH A TRACE OF SHELL AND MICA. SPECIFIC GRAVITY = 2.63	--	--	--	--

Project CANAVERAL HARBOR CHANNEL

Area LAB NO. 73/3320 *

Boring No CB-CH88-2 ,SAMPLE --

Date 11/10/88

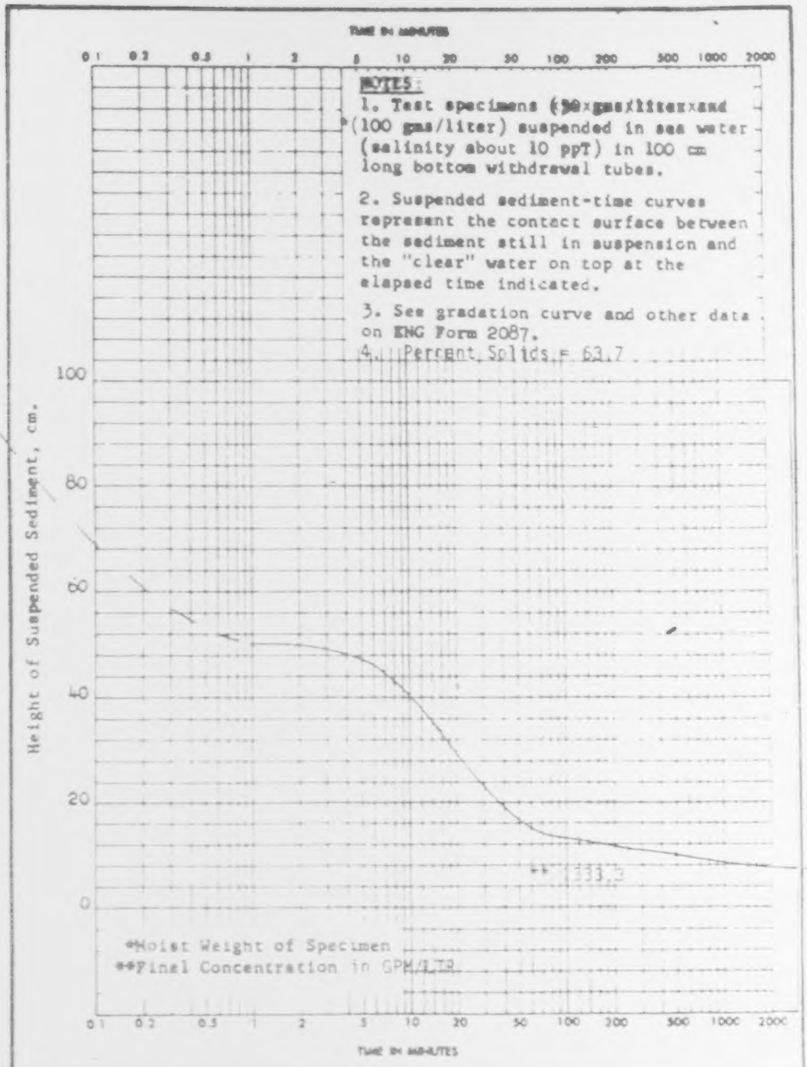
GRADATION CURVES

ENG FORM 1 MAY 63 2087

*See sedimentation rate time curve on SAL Form 3023

Reqn. No. RM-CW-89-0002
Work Order No. 5701

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY,
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GEORGIA 30061



NOTES:

1. Test specimens ~~(50 gms/liter and~~ *(100 gms/liter) suspended in sea water (salinity about 10 ppT) in 100 cm long bottom withdrawal tubes.

2. Suspended sediment-time curves represent the contact surface between the sediment still in suspension and the "clear" water on top at the elapsed time indicated.

3. See gradation curve and other data on ENG Form 2087.

4. Percent Solids = 63.7

PROJECT Canaveral Harbor Channel			
AREA Lab No. 73/3320			
BORING NO CB-CH88-2	SAMPLE NO ---	DEPTH EL -41.7/-45.4	DATE 15 Nov 88

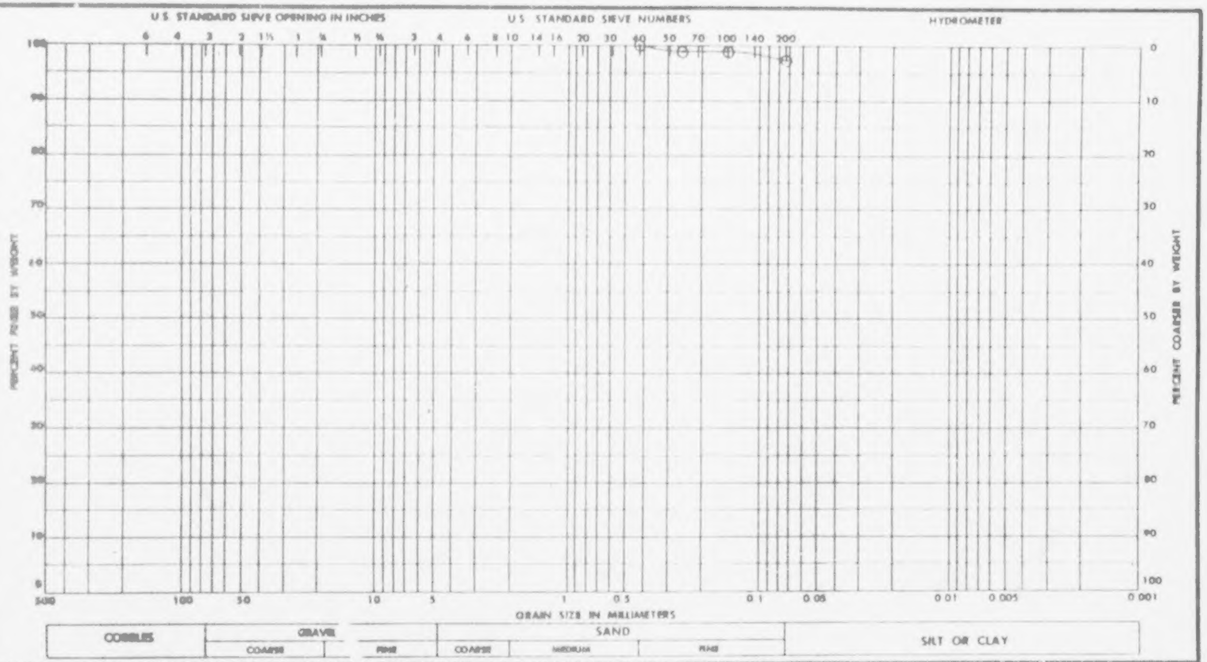
SUSPENDED SEDIMENT-TIME CURVES (TRANSLUCENT)

SAD Form 3023
26 Oct 72

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GA. 30060

W.O. No. 5701

Req. No. RM-CW-89-0002



Sample No.	Elev or Depth	Visual Classification	Nat w %	LL	PL	PI
--	-39.9/-43.4	FAT CLAY (CH),GRAY WITH A TRACE OF SAND,MICA,AND ORGANIC MATTER. SPECIFIC GRAVITY = 2.66	--	--	--	--

Project CANAVERAL HARBOR CHANNEL

Area LAB NO. 73/3321 *

Boring No. CB-CH88-7 ,SAMPLE NO. --

Date 11/10/88

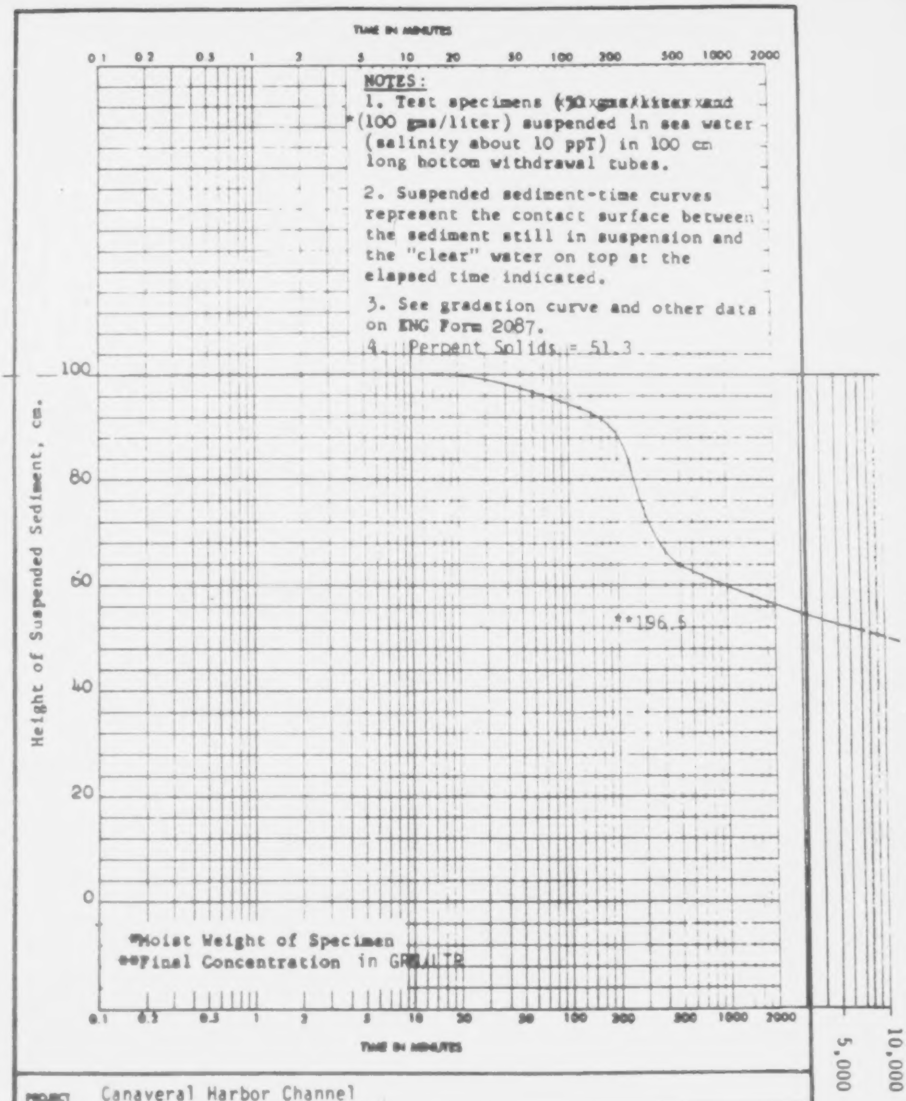
GRADATION CURVES

ENG FORM 1 MAY 63 2087

*See sedimentation rate time curve on SAD Form 3023

DEPARTMENT OF THE ARMY, SOUTH ATLANTIC DIVISION LABORATORY,
CORPS OF ENGINEERS, 611 SOUTH COBB DRIVE, MARIETTA, GEORGIA 30061

Reqn. No. RM-CW-84-0002
Work Order No. 5701



NOTES:

1. Test specimens ~~(50 gms/liter and~~ *(100 gms/liter) suspended in sea water (salinity about 10 ppT) in 100 cm long bottom withdrawal tubes.

2. Suspended sediment-time curves represent the contact surface between the sediment still in suspension and the "clear" water on top at the elapsed time indicated.

3. See gradation curve and other data on ENG Form 2087.

4. Percent Solids = 51.3

*Moist Weight of Specimen
**Final Concentration in GRM/LTR

PROJECT Canaveral Harbor Channel			
AREA Lab No. 73/3321			
BORING NO. CB-CH88-7	SAMPLE NO. ---	DEPTH EL -39.9/-43.4	DATE 15 Nov 88

SUSPENDED SEDIMENT-TIME CURVES (TRANSLUCENT)

SAD Form 3023

APPENDIX D
CANAVERAL HARBOR
REAL ESTATE

1. Statement of Purpose. This Real Estate Appendix is tentative in nature for planning purposes only and both the real property requirements and the estimate of value are subject to change even after approval of this Feasibility Report.

2. Project Authorization. The feasibility study of modifications to Canaveral Harbor to accommodate present and prospective future commerce, both military and civilian, was authorized by resolutions adopted by the Committees on Public Works of the United States Senate and House of Representatives on April 1, 1969, and December 11, 1969, respectively.

3. General Description of Project Area.

a. Project Description. The existing Federal project at Canaveral Harbor, Florida is recommended for deepening and widening pursuant to this Feasibility Study. The recommended modifications are to deepen the existing (37′ by 400′) channel to 41 feet mean low water (width 400′), deepen and widen the existing (36′ by 300′) inner channel to 40 feet mean low water by 400 foot wide , deepen the existing (35′ by irregular shape) Middle Turning Basin to a 39 foot depth mean low water by 1,200 foot diameter, and the deepening of the east 1,800 feet of the existing (31′ by 400′) west access channel to a depth of 39 feet mean low water by 400 foot wide.

The project also consists of the following recreation improvements. The Lock Park located immediately south of the existing Canaveral Lock on land owned by the United States will be improved by providing picnic shelters, a play structure, an open play area, a small fishing dock, an interpretive sign, a short boardwalk to a dock on the inner lagoon for nature observation rest rooms and a parking lot.

The jetty park located on the southside of the Inner Channel will have constructed on it a paved walkway, a fish cleaning station, a guardrail with recessed lighting, and an entrance deck connecting the walkway to the existing recreation facilities (Note: The 1,600 foot south jetty walkway includes the 600 foot extension to be constructed under the existing authorized sand transfer - jetty extension project).

b. Right-of-way Requirements. The real estate requirements for the project consist of the north inner channel upland area consisting of approximately 4.30 acres and 0.91 acres of upland along the South Bank to accommodate the inner channel widening as part of the navigation improvement. Additionally, there might be a requirement for a temporary 1-year stone stockpile area adjacent to the inner channel work to store the existing stone bank protecting pending their continued utility. Until stone will be ocean disposed. All dredged material will be ocean disposed at an area disposal site located 9 miles offshore.

The proposed Lock Park Recreation Development is on lands owned in fee by the United States. The proposed jetty park recreation development is on lands owned in fee by the Local Sponsor, Canaveral Port Authority. The United States received from the Local Sponsor, and enjoys a perpetual easement and right-of-way for the South jetty.

c. Government owned Land in the Project Area. The navigation improvement of the inner channel requires the use of United States lands utilized by the United States Air Force at Canaveral Air Force Station. The request for a determination of availability has been made to the United States Air Force together with a statement of all cost thereof and a response is awaited. The United States enjoys navigational servitude rights for all the remaining navigation project requirements with the possible exception of the to be determined temporary stone stockpile area requirement.

The Lock Park recreation improvement will occur on fee owned lands of the United States. The Jetty Park improvement will occur on fee owned lands of the Local Sponsor over which the United States has been grouted a Jetty use easement and right-of-ways.

4. Appraisal Information. The area surrounding the project is Port/Industrial use lands.

5. Federal responsibilities for P.L. 91-646, as amended, compliance.

There exist no persons or businesses to be relocated by the project.

6. Estimated costs of lands, easements, rights-of-way, and relocations (LEER).

The lands needed for the channel widening to the north requires 4.30 acres of upland all owned by the United States and used as part of Canaveral Air Force Station. A determination of availability has been requested together with the required cost of same. The lands needed for the channel underway to the south requires 0.91 acres of land along the bank. The estimated value of the channel improvement property is $171,844.

The project will require the relocation of a dolphin pier, a submerged cable, a spoil dike relocation and a road relocation. These items are owned by the United States through the Department of the Air Force and will be the local cooperation responsibility of the Local Sponsor. The Local Sponsor has and continues to coordinate these efforts.

7. Acquisition of Roads. No roads will be acquired for the project and the project will be constructed by barge and dredge boats.

8. Mineral Rights. There exist no known minerals immediately within the project lands that will affect the construction, operation and maintenance of the project for project life.

9. Timber/Vegetation Cover. There exists no timber or valuable or significant vegetative cover that will be affected by the construction, operation and maintenance of the project for project life.

10. Relocations of Towns and Cemeteries. There exist no relocations of towns or cemeteries for construction, operation and maintenance of the project.

11. Operation/Maintenance Responsibilities. The Federal Government shall operate and maintain the general navigation features of the project assigned to commercial navigation for project life. The Local Sponsor shall operate and maintain all other features of the project for project life.

12. Summary of Project Real Estate Costs.

Real Estate Estimates

Estimate of Cost (Date of Value 6/20/90

a.	Land and Damages			
	Land (5.21 acres)		$171,844	
	Improvements		$0	
	Minerals		$0	
	Severance		$0	
	Total Lands and Damages		$171,844	
b.	Acquisition - Administration Costs			
	Federal		$15,000	1/
	Non-Federal		$15,000	
c.	Public Law 91-646		$0	
	Total (a-c)		$201,844	
d.	Contingencies	25%	$50,461	
	Total Estimated Real Estate Costs		$252,305	2/

1/ This cost is included as part of the planning, engineering, and design (PED) work in preparation for construction, as shown in tables 30 and 31.

2/ Removing the $15,000 results in a reduction of $18,000 from the total real estate estimate making the final cost $234,000, which is a local cost.

13. Acquisition Schedule. The property and relocations needed for the project are currently being discussed by the Local Sponsor and the United States Air Force.

14. Estates. The Local Sponsor owns the lands south of the inner channel in fee and will provide a standard estate perpetual channel easement to the United States. The north upland lands needed for the inner channel improvements will be made available by the Air Force.

IMPACTS OF IMPROVEMENTS ON LITTORAL PROCESSES

Canaveral harbor is located on the Atlantic Coast of Florida in the lee, and southwest, of Cape Canaveral. The cape extends oceanward of the general alignment of the shoreline from about 50 miles to the north to 30 miles to the south. From the cape, shoals extend southeast in the ocean about 7 to 8 miles in water depths from 3 to 16 feet. The projecting shoal and the recurving south shore of the cape partially enclose and protect an area of deeper water known as Canaveral Bight, with natural depths of 20 to 40 feet. The northwest part of this bight, approximately 3 miles southwest of Cape Canaveral was the original, open coast, Canaveral Harbor. The entrance to the existing harbor is located in the southwest quadrant of the bight.

The cape is a very complex barrier island system that reflexes similar complex littoral processes leading to several theories about the formation of the cuspate barrier island system on an otherwise straight shore line with uniform and parallel off shore bottom contours. During the initial pre-authorization studies (Corps of Engineers 1939 to 1941) it was observed that the cape had been built out east and south into the ocean by the deposit of littoral drift from the north, and the dune formation and former shore lines were quite marked. The dune lines formed by the accreting shore are shown on the 1951 USC&GS Quadrangle sheet, Cape Canaveral, Florida which depicts pre-project conditions in 1948. Between 1859, when the original Government land survey was made, and 1925 the shore line around the southerly and southeasterly face of the cape was built out by accretion of sandy material to about one-third of a mile. The greatest advance being at the easterly end of the beach near the cape, with the advance diminishing proportionally with increasing distance from the cape. A comparison of a 1877 Coast and Geodetic Survey and the survey of 1940, shows the cape accreting from 500 to 900 feet and depths on the shoals decreasing.

LITTORAL DRIFT ESTIMATES

In 1986, a study was made of the shoaling and transformation of waves in the vicinity of the cape and Canaveral Harbor by the U.S. Army Engineer Waterways Experiment Station (WES), Coastal Engineering Research Center (CERC). The study was to provide a 20-year time series of breaking wave conditions at 3-hour intervals for three sites north and two sites south of the harbor, all within the lee, or to the west and southwest, of the cape. The wave data used for the study was determined by a 20- year hindcast of waves for the Atlantic Ocean coast for the period 1956-75. The hindcast was computed by WES and described in WIS Report 6, "Atlantic Coast Hindcast, Phase II, Wave Information" (WES, March 1982). The hindcast provides a 20-year time series of wave height, wave direction, and wave period at 3- hour intervals for both sea and swell components at a deep water location offshore of the cape.

The 1986 WES study involved the transformation of the 20 years of hindcast of deep water waves into conditions at a 60-foot depth, refraction calculations to bring representative waves from deep water to shore, and generation of a 20-year time series of breaking wave conditions for the five study sites. Using the data generated by the CERC study the potential rate of littoral transport in the vicinity of Canaveral Harbor was calculated using the following equation, which is based on the formula Q = A*Pl*f from the Shore Protection Manual (SPM, 1984). The results are printed in the General Design Memorandum (GDM), "Canaveral Harbor, Florida, Sand Bypass System", (1987). The estimated potential littoral drift rate is 200,000 cubic yards to the south, 120,000 cubic yards to the north.

The calculated potential littoral drift rates and the associated rates of accretion for the reaches between the study sites were compared with historical shore line maps and more recent surveys. The comparison of the historic shoreline surveys with the WIS data indicates that the estimated potential littoral drift rates provide a fairly accurate measure of littoral drift in the study area. The entire study area shoreline was accreting prior to the construction of the harbor entrance channel through the barrier beach and the construction of the jetties. This accretion varied from about 1.5 to 2 feet annually in the vicinity of the harbor to 30 to 40 feet annually immediately west of the cape.

Other physical forces influencing sediment movement in the area is the presence of a northerly flowing offshore current. Float observations made during the study on January 30 and February 2, 1940, from an approximately east-west line about one-half mile northward from the proposed harbor site to a similar line three- fourths mile to the south, showed a northerly flowing current about parallel to the shore between the shore line and about a mile offshore, which turned eastward and northeastward in about the site of the proposed harbor. The direction of the currents was about the same during both flood and ebb tide. Near the shore during the flood tide the drift averaged about three-eights mile per hour (0.55 fps), during the ebb it averaged about one- half mile per hour (0.73 fps). After turning eastward the velocity was reduced, indicating that Canaveral Bight contains a large, slow-moving eddy.

It was further observed that the coast chart for Canaveral Bight showed the bottom to be a blue mud which would indicate the absence of significant offshore transport of littoral material into the bight. Geological investigations reveal that the cape and connecting barrier beaches have formed on top of silt and clay deposits with surface elevations as shallow as 18 feet below mean low water.

CANAVERAL HARBOR

The initial examination and survey of the bight for improvements to navigation 1939-41. Based on that study the initial Federal project was authorized in 1945. The project provided for a 27- foot deep entrance channel and turning basin to be dredged into the barrier beach from the 27-foot depth in the bight on an east- west alignment. The entrance into the basin was to be stabilized by jetties extending to the 12-foot contour and the harbor connected to the Intracoastal Waterway, to the west in Indian River, by an 8 foot deep barge canal and lock.

The initial cut through the barrier beach was made in October 1951. The entrance channel was about 90 percent complete in March 1952, when dredging was suspended due to lack of progress. Erosion of the adjacent beach and shoaling of the channel was so rapid that project dimensions could not be obtained. Following construction of the jetties, the project was completed in September 1954. The harbor has been enlarged and deepened twice since initial completion; however, these later improvements did not magnify the initial project impacts on the adjacent shore lines. The total interruption of the littoral drift to the south occurred with completion of the initial dredge cut into the barrier beach.

Following studies of the impact of the harbor on the adjacent shorelines in 1958 authority was provided in 1962 (Senate Document 140/87/2 23 October 1962) to construct and operate a sand transfer plant. The plant, currently under design, will intercept littoral material on the north side of the harbor for transfer to the south shore to reduce shoaling in the entrance channel. To further reduce losses from the south shoreline the south jetty will be extended in conjunction with the construction of the sand transfer plant.

POST PROJECT CONDITIONS

Shoreline Changes The physical effects on littoral processes occurred immediately following construction and the impact on the shore line occurred over the ensuing years. As early as 1954, the year the jetties were completed, areas of accretion and erosion were well defined in the immediate vicinity of the harbor as indicated in the following table. By 1958, there was substantial accretion of the shore line for 0.5 mile north of the harbor, and progressive recession for one mile to the south.

Harbor Maintenance

Based on the southerly drift of 200,000 cubic yards north of the harbor and 120,000 cubic yards of material from the south, it was estimated that the annual shoaling rate in the harbor would total no more than an annual average volume of about 320,000 cubic yards and that this quantity would be available on an average annual basis for disposal on the down-drift shore. However, as the harbor depths were increased, the quantity of shoaling increased significantly above the estimates of littoral drift. From 1952 to 1963 the average annual yardage removed from the harbor was 325,000 cubic yards, from 1963 to 1979 the average was 675,000 cubic yards, and from 1979 to the present the average is 925,000 cubic yards.

Shoaling Sediments Due to the unanticipated increase in the rate of shoaling, which exceeds the quantities that could be predicted by analytical methods, the Coastal Engineering Research Center conducted a shoaling study (WES 1985) to estimate the shoaling rate for littoral material only. The database consisted of bathymetric survey maps and 44 boring logs from September 1979 to November 1982. The bathymetric maps, surveyed in September- October 1979, June 1980, November 1980, and November 1982, were digitized into state plane coordinates and a contouring software package used to compute shoaling volumes.

Results of the study indicate a shoaling rate for sand in the entrance channel and turning basin of 280,000 cubic yards a year for the period September 1979 through November 1982. Due to the fact that the study was based upon existing available data and the data collection effort was not coordinated for the explicit purpose of the study, no assessment of the time-series, or directionality of sediment transport could be made from the data set. It was concluded that this quantity could not be considered as an estimate for net littoral transport at Port Canaveral.

Using the maps provided in the CERC report to define and locate the units of shoaling, the quantities of material and the percentage of sand for each unit, a quantitative comparison of the littoral drift transport rates developed using the WIS data was made. Of the total quantity dredged during the study period (2,552,000 cubic yards), it is estimated that only 873,000 cubic yards, or 34 percent of the material, could have been deposited by littoral forces. This compares with the estimated littoral rate of 315,000 cubic yards using the WIS data, which is 34 percent of the average annual total shoaling rate of 925,000 cubic yards determined from dredging records for the period from 1979 to 1988.

This would indicate a predicted shoaling rate between 284,000 and 347,000 cubic yards and a net southerly drift between 124,000 and 152,000 cubic yards. The net loss of littoral material from the shore line to the south of the harbor is estimated to be between 335,000 and 410,000 cubic yards a year.

Ocean Disposal Area The ocean disposal area for Canaveral Harbor has been located in three nearshore areas since initial project construction. Based on the offshore velocity measurements in 1940, it was concluded that sediment would be moved into the entrance channel from the south, thus the offshore disposal area was initially located to the north of the harbor in Canaveral Bight. At some point in time between 1951 and 1956, the disposal area was moved to the immediate south of the entrance channel. Concurrent with the deepening of the channel from 27 feet to 34 feet in 1956-57, the disposal area was moved to an area located between 4.5 and 8 miles offshore and about 2.5 miles south of, and parallel to, the ocean end of the 46-foot channel constructed in 1974-76

The ocean disposal area covers four square miles of ocean bottom and has been the repository of 29.9 million cubic yards of material since 1955 (19.8 million from maintenance dredging and 7.6 million from new work). Using WIS data for estimates of potential littoral drift rates, it is estimated that 8.8 million cubic yards of the material disposed of on this site is material from the littoral zone in the vicinity of the harbor. The maintenance material placed in the disposal area consists of a combination of littoral zone type sediments and quantities of silts and floculated clays. Based on the estimated potential drift using the WIS data, the littoral zone sediments have a relatively constant average annual shoaling rate. However, the quantities of silts and floculated clays have continued to increase over the project life from about 183,000 cubic yards in the 1950's, to 276,000 in the mid-1960's, to 498,000 in the early 1970's, to 738,000 in the past 8 years.

The increases following the deepening to 34 feet in 1956-57 and to 46 in 1974-76, have been attributed to the increase in channel length. The increase in channel length provides a larger bottom area for shoaling to occur and for intercepting nearshore bottom drift material. This would be the logical explanation for the increase in shoaling rates. However, the most significant finding in the analysis of the dredging records is the impact of the disposal of material from new work in 1965. This material was dredged from the canal to the west of the harbor, which is separated from the harbor and entrance channel by a lock. No new bottom areas were created for shoaling within the harbor or the entrance channel. In the two years following this ocean disposal, the average annual shoaling rate for the non-littoral material in the entrance channel and harbor increased from 276,000 cubic yards to 498,000 cubic yards, an increase of 80 percent. This shoaling rate remained relatively constant for the following 5 years until the channel deepening began in 1974.

IMPACT OF PROPOSED IMPROVEMENTS

The evaluation of the impacts of the construction of Canaveral Harbor on the adjacent shore line, and the efficiency of operation and maintenance is based on available, existing data. There is documentation to show that the shore line was stable and accreting prior to the initial construction of the harbor project. Previous reports and analysis of available data provide evidence that the construction of the harbor through the barrier beach has resulted in accretion to the north, erosion to the south, and between 284,000 to 347,000 cubic yards of littoral material shoaling in the channel. The estimated net loss of littoral material from the shore line south of the harbor is between 335,000 and 410,000 cubic yards a year.

The recent increase in channel shoaling with fine material (silts and clays) results in part from the increase in channel depths and lengths since initial construction. Increases in channel width and depths expose more of the underlying clay and silt material to tidal currents. From the limited data available, there is also evidence that the material removed from the channel and placed in the ocean disposal area is placing more of this material in suspension in the nearby offshore areas.
In the evaluation of modifications to or new work in the harbor the net impact will be an increase in the annual dredging quantities equivalent to about 20 percent of the volume of material dredged as new work placed in the ocean disposal area. The estimated annual loss of 200,000 cubic yards of drift material shoaling the channel from the north and 120,000 cubic yards from the south represent all of the material being lost from the barrier beaches.

Construction of the sand-transfer plant and extension of the south jetty will mitigate to some extent the impact of the harbor on the down-drift shoreline. However, additional beach nourishment operations will still be needed to augment this transferred material and to match erosion losses further to the south. The eroding problem south of the inlet and the erosion problems further to the south are currently under study (Committee on Public Works and Transportation of the House of Representatives Resolution dated 23 September 1982) with a view to providing a comprehensive Federal shore protection project for the entire county. Therefore, no additional mitigation measures are warranted for the harbor improvements proposed in this report.

CANAVERAL HARBOR CHANNEL, FLORIDA

FEASIBILITY REPORT

IMPROVEMENTS FOR NAVIGATION

APPENDIX F

NAVIGATION BENEFIT ANALYSIS

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COMMODITY TONNAGE ANALYSIS

The first step in the projection of future tonnage through Canaveral Harbor was the identification of import and export tonnage by commodities and trade routes at the present time. Future tonnages for these commodities and trade routes were then projected by recognized statistical procedures described below. The resulting projections were summed to provide a projection of total harbor tonnage by 10-year increments for the 50-year period of analysis from 1993 to 2043.

Identification of Major Commodities

The Corps of Engineers publication Waterborne Commerce of the United States provides annual summaries of foreign, domestic and local tonnage movements by commodity class for harbors and waterways in the United States. Four major commodities groups, some of which include more than one commodity class, were found to comprise 84 percent of total deep draft tonnage at Canaveral Harbor in 1987. The major commodity groups and their component commodity classes are shown in table F-1, below.

TABLE F-1

COMMODITY GROUPS AND THEIR COMPONENT COMMODITY CLASSES
CANAVERAL HARBOR, FLORIDA
1987

COMMODITY GROUP	PERCENT OF TONNAGE	COMMODITY CLASSES	
1. Gasoline	17.7	1711	Gasoline, including natural gasoline
2. Fuel Oil	27.9	2914 2915	Distillate fuel oil Residual fuel oil
3. Building Cement	29.6	3241	Building cement
4. Scrap Metal	8.6	4011	Iron and steel scrap

Source: Waterborne Commerce of the United States, U.S. Army Corps of Engineers.

Projection of Major Commodities. An analysis of historical tonnages was made for each major commodity group. Historical trends were identified and statistically tested. In cases of verifiable growth trends, possible indications of future growth were tested by correlation and regression techniques. Historical and projected tonnages were discussed with representatives of the firms which import or export the major commodities. Capacities of existing facilities were considered in the projection of future tonnages. The analyses for the major commodity groups follow.

GASOLINE

Historical trends.

The historical record for Canaveral Harbor gasoline receipts, shown in table F-2, exhibits three distinct trends for different periods. The first period, from 1968 to 1974, was characterized by relatively stable levels of gasoline tonnage. The second period, from 1975 to 1980, saw gasoline receipts virtually cease at Canaveral. The third period, from 1981 to the present has been characterized by sustained growth in gasoline tonnage.

The recent increases in gasoline tonnages can be attributed to the operations of a single firm, Coastal Fuels Marketing, Inc.. Gasoline shipped through Canaveral is distributed to the eastern-most portion of the fast-growing Orlando area, as well as in the Melbourne-Titusville area. About one-third of the gasoline originates at refineries in the U.S. Gulf coast region and is loaded aboard ships in New Orleans. The remaining two-thirds originates at foreign refineries. In the past, foreign origins have included Brazil, Venezuela and Aruba. Coastal Corporation, the corporate parent of Coastal Fuels Marketing, recently purchased a large refinery in Aruba. That facility is expected to be the primary point of origin for future gasoline imports to Canaveral.

TABLE F-2

HISTORICAL GASOLINE RECEIPTS
CANAVERAL HARBOR
1968 - 1987

Year	Tons
1968	106,351
1969	101,083
1970	120,724
1971	114,139
1972	41,193
1973	117,639
1974	109,286
1975	13,987
1976	0
1977	0
1978	15,147
1979	0
1980	1,211
1981	50,602
1982	103,569
1983	184,976
1984	282,608
1985	243,554
1986	252,710
1987	366,204

Total waterborne shipments of gasoline to Florida have increased from about 8 million tons in 1968 to more than 15 million tons in 1987. Canaveral Harbor's share of the total has varied considerably over that period. Until 1983, Canaveral had never accounted for more than 1.3 percent of the total for the state. In recent years, the Canaveral Harbor share of the total has increased from 1.4 percent in 1983 to 2.4 percent in 1987, the latest year for which data are available. Waterborne shipments of gasoline to Florida ports and the state totals are shown in table F-3.

TABLE F-3

WATERBORNE GASOLINE TONNAGE
STATE OF FLORIDA
1968 - 1987

(thousands of tons)

	Canaveral	Jax'ville	Tampa	Port Everglades	Palm Beach	Miami	Florida Total
1968	106	1,770	3,106	2,972	0	57	8,011
1969	101	1,851	3,369	3,269	0	29	8,620
1970	121	1,871	3,633	3,374	0	0	8,999
1971	114	1,980	3,945	3,826	1	6	9,871
1972	41	1,957	4,353	4,210	1	45	10,607
1973	118	2,139	4,817	4,527	0	134	11,735
1974	109	2,327	5,216	4,343	0	9	12,005
1975	14	2,388	4,959	4,814	0	13	12,187
1976	0	2,417	5,455	5,150	0	8	13,029
1977	0	2,361	6,039	5,868	0	2	14,271
1978	15	2,603	6,749	6,471	0	86	15,925
1979	0	2,289	6,160	6,310	0	12	14,772
1980	1	2,178	5,876	5,413	0	3	13,472
1981	51	1,954	6,249	5,319	0	1	13,574
1982	104	1,749	6,029	5,456	0	2	13,339
1983	185	1,913	6,396	5,196	0	0	13,691
1984	283	2,340	6,470	5,591	0	7	14,692
1985	244	2,125	6,208	5,560	0	0	14,136
1986	253	2,146	5,601	4,737	0	0	12,737
1987	366	2,370	6,293	6,329	0	0	15,358

Source: Waterborne Commerce of the United States.

Gasoline receipts increased by about 13 percent between 1981 and 1987 in the state of Florida, compared to a greater than 600 percent increase through Canaveral Harbor. Tonnages through Canaveral Harbor have increased strongly and the Port's overall market share has increased accordingly. While Canaveral's share of the total market within the state remained small at 2.4 percent in 1987, that represented triple the 1982 market share of 0.8 percent. It would obviously be unrealistic to expect Canaveral's market share to double every five years; however, the experience of the past five years indicates a strong trend toward higher levels of gasoline tonnage for the port than in previous years.

Total gasoline consumption in the U.S. can be derived from two components (1) the gasoline output of U.S. refineries and (2) gasoline imports. Historical data for total consumption and those two components are shown in table F-4. **As the table shows, imports have grown from none in 1949 and 1950 to more than 18 million tons in 1988; however,** imports still supply a very small proportion of total consumption (only 5 percent in 1988). As total consumption has grown from 121.7 million tons in 1949 to 348.1 million tons in 1988, U.S. refinery output has grown from 121.7 to 329.9 million tons.

TABLE F-4

U.S. GASOLINE CONSUMPTION
IMPORTS & REFINERY OUTPUT
1949 - 1988

(thousands of tons)

	Imports	Refinery Output	Total
1949	0	121,665	121,665
1950	0	129,713	129,713
1951	47	143,915	143,962
1952	237	148,107	148,344
1953	47	160,011	160,058
1954	142	160,011	160,153
1955	615	172,793	173,408
1956	237	131,336	181,574
1957	379	183,681	184,060
1958	1,799	183,208	185,007
1959	1,752	191,256	193,007
1960	1,282	196,052	197,334
1961	1,373	196,463	197,836
1962	1,799	203,564	205,363
1963	2,083	207,825	209,908
1964	1,377	207,445	208,821
1965	1,326	213,506	214,831
1966	2,036	225,814	227,850
1967	1,988	233,862	235,850
1968	2,801	246,845	249,646
1969	2,935	258,953	261,888
1970	3,172	269,841	273,013
1971	2,793	282,623	285,416
1972	3,228	298,113	301,341
1973	6,344	309,133	315,477
1974	9,657	301,086	310,743
1975	8,711	308,660	317,371
1976	6,219	324,696	330,915
1977	10,273	332,804	343,077
1978	8,995	339,431	348,426
1979	8,569	323,809	332,378
1980	6,646	308,082	314,727

TABLE F-4 (continued)

U.S. GASOLINE CONSUMPTION
IMPORTS & REFINERY OUTPUT
1949 - 1988

(thousands of tons)

	Imports	Refinery Output	Total
1981	7,432	302,979	310,412
1982	9,326	300,139	309,465
1983	11,693	300,139	311,832
1984	14,194	306,183	320,376
1985	18,037	303,926	321,963
1986	15,433	319,548	334,981
1987	18,179	323,809	341,988
1988	18,229	329,918	348,146

Correlations.

The tremendous growth in Canaveral gasoline receipts since 1981 and the period of little or no receipts from 1975 to 1980 had an adverse impact on time series causal analysis of gasoline tonnages. The coefficient of determination (R^2) between total U.S. gasoline consumption from 1968 to 1987 (independent variable) and Canaveral gasoline receipts was less than 0.01. The R^2 for U.S. refinery output and Canaveral receipts for the same period was also less than 0.01. The R^2 for total U.S. gasoline consumption and Canaveral gasoline between 1981 and 1987 was much higher at 0.73.

A possible relationship between Canaveral tonnage and tonnage at the ports of Jacksonville and Port Everglades was also investigated. The R^2 for Jacksonville gasoline receipts (independent variable) and Canaveral receipts for 1981 to 1987 was 0.75. The R^2 for Port Everglades and Canaveral receipts for the same period was much lower at 0.22. This result indicates that, while there may be some relationship between the market areas served by Jacksonville and Canaveral, there is little or no relationship between the Port Everglades and Canaveral market area.

Interviews.

Interviews, both face-to-face and by telephone, were conducted to assess trends in gasoline receipts and tonnage through Canaveral Harbor. A spokesman for Coastal Fuels was contacted to discuss the company's plans for Canaveral Harbor. He confirmed that in recent years Coastal Fuels has been bringing in more gasoline to serve the central Florida market.

Coastal Fuels projects gasoline tonnage at Canaveral at 391,000 tons in 1993, increasing by 5 percent annually to 552,000 tons in 2000. There is sufficient undeveloped land at the port to allow future expansion of storage capacity for gasoline and fuel oil. A site of approximately 40

acres was identified immediately west of the scrap metal storage area as a potential site for future tank farm expansion. The firm's projections do not include potential tonnage increases associated with construction of petroleum products pipeline between Canaveral Harbor and Orlando. This project is in the preliminary planning phase and, if implemented, could result in substantial tonnage increases at Canaveral.

Projections.

The Energy Information Administration of the U.S. Department of Energy (DOE) projects future energy needs for the nation. The DOE's Annual Energy Outlook for 1989 includes projections of the consumption of energy by source and end use sector, and of petroleum supply and disposition balance. Those projections indicate that gasoline consumption is expected to increase by less than one percent from 1987 to 1993 and to remain relatively stable thereafter through the year 2000, the final year of the projection. Those projections are shown in table F-5.

TABLE F-5

PROJECTED GROWTH RATES
U.S. MOTOR GASOLINE SUPPLY AND CONSUMPTION
1987-2000

	1987-1993	1993-2000	1987-2000
Gasoline Supply	0.14%	0.00%	0.06%
Gasoline Consumption	0.11%	0.00%	0.05%

Source: Derived from Annual Energy Outlook (1989)

The slow growth/no growth scenario suggested by these projections, while it may be accurate at the national level, obviously does not fit the experience of recent years at Canaveral. Applying the 0.14 percent annual growth rate to 1987 Canaveral Harbor gasoline receipts gives a projection of approximately 370,000 tons in 1993 and thereafter. This projection can be viewed as a pessimistic estimate for future Canaveral gasoline tonnage.

An optimistic projection of future gasoline tonnages can be obtained by extending the trend line for 1981-1987 Canaveral Harbor receipts into the future and ignoring the constraint of the limited throughput capacity of existing facilities. This optimistic growth scenario yields projections of 632,000 tons in 1993, increasing to 2,962,000 in 2043. This projection, while patently unrealistic, gives some perspective on the tremendous rate of increase in gasoline tonnage over the last seven years.

A more moderate projection can be derived from the regression line for U.S. gasoline consumption for 1981 to 1987 and Canaveral receipts. Future U.S. consumption for 1993 was estimated using 0.11 percent annual growth rate shown in table F-5. The regression line was then used to project Canaveral tonnage. This method results in a projection of 404,000 tons of gasoline at Canaveral in 1993, remaining constant at that level in the future. This projection gives a more realistic estimate of future tonnage than the pessimistic projection; however, it implies a sudden change to a slower growth trend than in recent years.

Each of the three projection methods yielded a different estimate, with different strengths and weaknesses. The most likely tonnage projection was based on a combination of the Coastal Fuels projections and the moderate projections described above. The base year (1993) tonnage projection by Coastal Fuels, 391,000 tons, was very close to the moderate projection of 404,000 tons. Recognizing this, the most likely projection of tonnage in the base year is 400,000 tons. The base year tonnage was increased at an annual rate of 5 percent through the year 2003. This agrees with the projected annual growth rate of 5 percent through 2000 expected by Coastal Fuels. From 2003 to 2013, tonnage was projected to grow at an annual rate of 2.5 percent, half the rate projected for the previous decade, in recognition of the national level forecast toward stable supply and consumption. Future tonnage was held constant at 830,000 tons per year after 2013, again in recognition of the national level forecast. The most likely projection of future gasoline tonnage at Canaveral is shown in table F-6. That projection provides the basis for calculating with and without project transportation costs. Implicit in the projection is construction of additional storage capacity to accomodate projected increases in tonnage after the year 2000.

TABLE F-6

PROJECTED GASOLINE RECEIPTS
MOST LIKELY FUTURE
1993 - 2043

1993	400,000
2003	650,000
2013	830,000
2023	830,000
2033	830,000
2043	830,000

FUEL OIL

Historical trends.

The historical record for Canaveral Harbor fuel oil receipts, shown in table F-7, exhibits two distinct trends for different periods. The first period, from 1968 to 1975, was characterized by fast growth in the annual level of import tonnage. The second period, from 1976 to 1987, saw an erratic but distinct downward trend in the level of annual fuel oil import tonnage.

The decreases in fuel oil tonnages since 1976 can be attributed primarily to reductions in the use of fuel oil for electric power generation. Fuel oil shipped through Canaveral is used by two firms for electric power generation. Domestic fuel oil originates at refineries in the U.S. Gulf coast region and is loaded aboard ships in New Orleans. Preliminary information for 1988 indicates that approximately 20 percent of fuel oil received at Canaveral originated at foreign ports. This is expected to increase to 33 percent in the future, due to Coastal Corporation's acquisition of the Aruba refinery.

TABLE F-7

HISTORICAL FUEL OIL RECEIPTS
CANAVERAL HARBOR
1968 - 1987

YEAR	TONS
1968	445,504
1969	715,255
1970	832,658
1971	979,414
1972	1,054,765
1973	1,096,132
1974	1,485,795
1975	1,648,638
1976	1,367,186
1977	1,349,856
1978	1,206,543
1979	1,426,848
1980	941,059
1981	840,757
1982	854,999
1983	752,165
1984	614,802
1985	398,324
1986	518,659
1987	574,288

Source: Waterborne Commerce of the United States.

Total waterborne shipments of fuel oil to Florida exhibit a pattern similar to Canaveral harbor fuel oil tonnage. Florida fuel oil tonnage grew rapidly from 1968 to 1973. From 1974 through 1987 an erratic downward trend has prevailed. The trend in Canaveral Harbor tonnage has lagged the state trend, turning downward in 1976 rather than 1973. Canaveral Harbor's share of the state total has varied considerably over time, ranging from 4.8 percent in 1968 to 10.8 percent in 1975 (a year in which fuel oil tonnage reached a record high for Canaveral and state tonnage had already begun to trend downward). In most years, Canaveral has accounted for 6 to 9 percent of fuel oil tonnage for the state. Waterborne fuel oil tonnage for Florida ports and the state totals are shown in table F-8.

TABLE F-8

WATERBORNE FUEL OIL TONNAGE
STATE OF FLORIDA
1968 - 1987

(thousands of tons)

	Canaveral	Jax'ville	Tampa	Port Everglades	Palm Beach	Miami	Total
1968	446	2,959	2,074	2,045	644	1,156	9,323
1969	715	3,571	3,239	2,182	474	887	11,068
1970	833	3,656	2,486	2,470	552	878	10,874
1971	979	3,775	2,581	2,658	598	788	11,379
1972	1,055	4,788	6,151	2,956	772	1,092	16,814
1973	1,096	5,297	5,153	3,376	809	1,285	17,016
1974	1,486	4,899	5,019	2,799	627	1,112	15,942
1975	1,649	4,417	4,282	2,914	617	1,357	15,236
1976	1,367	5,020	4,427	2,869	638	1,673	15,994
1977	1,350	5,552	3,963	3,109	316	1,074	15,364
1978	1,207	5,205	3,575	2,905	305	164	13,362
1979	1,427	5,000	3,669	3,017	314	1,013	14,440
1980	941	4,585	3,728	3,257	484	1,515	14,511
1981	841	6,759	3,230	2,630	1,163	1,278	15,900
1982	855	3,470	1,852	1,896	522	721	9,315
1983	752	2,056	1,786	2,095	976	1,460	9,125
1984	615	2,098	2,461	1,850	808	1,073	8,905
1985	398	2,020	2,037	1,513	378	916	7,263
1986	519	2,290	2,068	2,149	281	2,007	9,314
1987	574	2,216	1,840	2,594	277	1,151	8,653

Source: Waterborne Commerce of the United States.

Fuel oil receipts have been relatively stable from 1982 to 1987 in the state of Florida, at approximately 9 million tons annually, except in 1985, which saw the lowest annual tonnage of record and appears anomalous. Tonnages through Canaveral Harbor continued to decrease erratically during that period, leading to erosion in Canaveral's share of the state total. Since 1984, Canaveral Harbor tonnage has remained relatively stable at approximately 500 to 600 thousand tons, again with the exception of 1985. It is interesting to note that Canaveral tonnage lagged the state totals by two years in going from an increasing trend to a decreasing trend, and a two-year lag can also be observed in the movement of tonnage toward a relatively stable level.

Total fuel oil consumption in the U.S. can be derived from two components (1) the fuel oil output of U.S. refineries and (2) fuel oil imports. Historical data for total consumption and those two components are shown in table F-9. As the table shows, imports grew from 11.6 million tons in 1949 to more than 100 million tons in the early 1970's; however, imports have since declined to less than 50 million tons in 1988. In the early 1970's imports accounted for approximately one-third of total U.S. fuel oil consumption. The import share has since declined to approximately one-fifth in 1988. From 1980 to 1988, consumption has remained relatively stable at approximately 250 million tons annually, with imports supplying 50 million tons and U.S. refineries supplying 200 million tons.

TABLE F-9

U.S. FUEL OIL CONSUMPTION
IMPORTS & REFINERY OUTPUT
1949 - 1988

(thousands of tons)

	Imports	Refinery Output	Total
1949	11,583	114,733	126,316
1950	18,445	123,516	141,961
1951	18,171	142,181	160,351
1952	19,707	146,423	166,130
1953	20,257	147,121	167,378
1954	19,927	144,376	164,304
1955	23,550	153,709	177,259
1956	25,266	164,589	189,855
1957	27,338	163,041	190,379
1958	29,644	149,866	179,510
1959	36,122	154,258	190,379
1960	36,991	150,277	187,268
1961	39,196	152,062	191,258
1962	41,501	152,611	194,112
1963	42,380	156,454	198,833
1964	46,239	151,928	198,167
1965	53,908	155,905	209,813
1966	58,739	157,552	216,290
1967	62,362	162,492	224,854
1968	68,918	167,341	236,259
1969	77,074	167,433	244,507
1970	91,951	173,471	265,422
1971	95,299	178,412	273,711
1972	105,909	188,809	294,718
1973	123,242	208,056	331,297
1974	102,985	205,311	308,296
1975	75,647	213,545	289,192
1976	85,817	236,700	322,517
1977	88,328	276,127	364,455
1978	83,881	265,697	349,578
1979	73,780	265,697	339,477
1980	59,505	233,397	292,902
1981	53,414	215,741	269,155
1982	47,705	202,017	249,722

TABLE F-9 (continued)

U.S. FUEL OIL CONSUMPTION
IMPORTS & REFINERY OUTPUT
1949 - 1988

(thousands of tons)

	Imports	Refinery Output	Total
1983	47,924	181,706	229,630
1984	52,459	196,516	248,975
1985	38,976	195,979	234,955
1986	50,285	202,566	252,851
1987	45,015	198,724	243,738
1988	48,166	209,121	257,287

Correlations.

Canaveral Harbor fuel oil receipts were regressed against U.S. refinery output and U.S. total consumption for the periods 1968-1987 and 1981-1987. The correlation between U.S. refinery output from 1968 to 1987 and Canaveral tonnage was poor, with a coefficient of determination (R^2) of 0.37. This result is probably due to the reduction in imports as a share of total consumption after 1974, which tended to stabilize U.S. refinery output at the same time total U.S. consumption, and receipts at Canaveral, were declining. The R^2 for U.S. refinery output and Canaveral receipts for the same period was more significant, at 0.65. This result indicates that Canaveral receipts have generally followed the trend in total U.S. consumption. The R^2 for total U.S. fuel oil consumption and Canaveral receipts between 1981 and 1987 was similar at 0.66.

A possible relationship between Canaveral tonnage and tonnage at the ports of Jacksonville and Port Everglades was also investigated. The R^2 for Jacksonville fuel oil receipts (independent variable) and Canaveral receipts for 1968 to 1987 was 0.50. The R^2 for Port Everglades and Canaveral receipts for the same period was 0.55. A multiple regression relating Canaveral receipts to both Jacksonville and port Everglades tonnages had an R^2 of 0.60. This result probably indicates that all three ports tonnages tend to follow the larger national trend in fuel oil consumption.

Interviews.

Telephone interviews were conducted to assess trends in fuel oil receipts and tonnage through Canaveral Harbor. Three companies were identified as consumers of the fuel oil received at Canaveral. They are: (1) Orlando Utilities Company, an electrical power utility company; (2) Florida Power and Light, also an electrical utility; and Coastal Fuels Marketing, a distributor of petroleum based fuels including marine bunker oil, diesel oil, home heating oil and fuel oil for industrial use. These three firms account for virtually all of the fuel oil tonnage at Canaveral Harbor.

A spokesman for Orlando Utilities provided information on the firm's use of Canaveral Harbor. He said that in 1988 and 1989 receipts have been in the range of 600-800,000 bbls. (100,000-130,000 tons). The fuel oil is used to fuel three combustion turbines (CT's) at the Indian River power plant, located approximately 8 miles from the port on the Indian River. Fuel oil is moved from the port to the power plant by barge. Storage facilites for 355,00 barrels of fuel oil are maintained at the plant. This storage allows the company to maintain substantial reserves even when the tanks at he port are empty.

The turbines were built in the mid 1960's and have just had major rehabilitation to extend their useful lives an additional 30 years. Orlando Utilities plans to keep the Indian River plant in service for more than 30 years from the present time, as the firm has no alternative for load management. The CT's are used for peaking power, to provide flexibility in load management in a system which relies on coal and nuclear baseload plants and has virtually no hydropower peaking capacity.

Orlando Utilities expects fuel oil use to grow by 5 percent annually for the near future. The company would like to be able to move fuel oil in larger shipments. They would prefer to be able to ship 300,000 bbls. on a single vessel, channel dimensions permitting. The company has storage capacity for 325,000 bbls. at the port.

A spokesman for Florida Power and Light (FP&L) was interviewed in regard to his company's use of Canaveral Harbor. He said that FP&L receipts at Canaveral were 1.8 million bbls in 1988 (290,000 tons) and 1.4 million bbls. (220,000 tons) through October 1989. The 1989 annual total is expected to be the same as 1988, 1.8 million barrels (290,000 tons).

He said that the fuel oil is used to fuel the steam turbines at the Cape Canaveral power plant, located approximately 3/4 mile form the port on the Banana River. Storage facilities for 536,000 barrels of fuel oil are maintained at the power plant. This storage allows the company to maintain substantial reserves even when the tanks at he port are empty. The power plant was built around 20 years ago and FP&L intends to keep it in service for as long as possible with periodic maintenance and major rehabilitation. The plant will continue in service for the foreseeable future, and will continue to be oil fired. The plant is also capable of burning gas, but only a limited amount of gas is available locally at Canaveral due to pipeline limitations. Available gas is insufficient to meet the plant's needs.

FP&L expects fuel oil use to grow slightly for the near future. Fuel oil is originates in gulf coast refineries and is shipped from New Orleans. They would like to be able to move fuel oil in larger shipments. The company would like to be able to receive shipments of 250,000 bbls. at Canaveral; however, approximately one half of tonnage is now and is expected to continue to be shipments by barge of approximately 100,000 tons each. Integrated tug barges are used for those shipments. The maximum shipment size which FP&L anticipates would be 250,000 bbls. since the company has storage capacity for 268,000 bbls. at the port.

A spokesman for Coastal Fuels confirmed that the firm has received 800,000-900,000 bbls. (130,000-140,000 tons) of fuel oil annually in recent years. The fuel oil moved by Coastal includes marine bunker oil, diesel fuel and oil for home heating and industrial use. The company recently constructed an additional storage tank for diesel fuel at the port, with a capacity of 120,000 barrels. Coastal expects Fuel oil tonnage to grow at approximately 5 percent annually through the year 2000.

In the past, most of the oil has come from gulf coast refineries and was shipped from New Orleans, with small amounts imported. With the recent purchase of the Aruba refinery, imports are expected to increase in the future. The total capacity of Coastal Fuels' fuel oil tanks at Canaveral is 290,000 bbls. and the firm anticipates an increase in shipment size with increased channel dimensions.

Projections.

The Energy Information Administration of the U.S. Department of Energy (DOE) projects future energy needs for the nation. The DOE's Annual Energy Outlook for 1989 includes projections of the consumption of energy by source and end use sector, and of petroleum supply and disposition balance. Those projections indicate that fuel oil consumption for electrical utilities is expected to increase by nearly seven percent annually from 1987 to 1993 and to increase at an annual rate of more than four percent from 1993 to 2000, the final year of the projection. Those projections are shown in table F-10.

TABLE F-10

PROJECTED GROWTH RATES
U.S. FUEL OIL SUPPLY AND CONSUMPTION
FOR ELECTRICAL UTILITIES
1987-2000

	1987-1993	1993-2000	1987-2000
Fuel Oil Supply	6.88%	4.42%	5.55%
Fuel Oil Consumption	6.80%	4.47%	5.54%

Source: Derived from Annual Energy Outlook (1989)

The growth scenario suggested by these projections agrees with the expectations of the electric utilities which receive fuel oil shipped through Canaveral Harbor. Both Orlando Utilities and Florida Power and Light Company cited expected annual tonnage growth rates of approximately five percent, which are very close to the national level projection. Correlation and regression analyses showed that trends in Canaveral Harbor tonnage tend to be related to the national level trend. For these reasons, the national level projections were used as the basis for projecting future fuel oil tonnage for electrical utilities at Canaveral.

The non-utility tonnage (140,000 tons) was subtracted from total 1987 Canaveral fuel oil tonnage, and the remaining tonnage was used as the basis for projecting the future utility-related tonnage. The DOE's fuel oil consumption growth rates were applied to the 1987 tonnage to project tonnage in future years. The DOE projection extends only to the year 2000. Tonnage was held constant after 2000, both because of the limits of the projection and in recognition of the limits on fuel oil usage by the existing power plants.

The DOE's Annual Energy Outlook for 1989 also includes projections for fuel oil consumption by the industrial and transportation sectors. Those projections indicate that fuel oil consumption for those sectors is expected to increase by nearly two percent annually from 1987 to 1993 and to increase at an annual rate of about one percent from 1993 to 2000, the final year of the projection. Those projections are shown in table F-11.

TABLE F-11

PROJECTED GROWTH RATES
U.S. FUEL OIL CONSUMPTION
FOR TRANSPORTATION AND INDUSTRIAL USE
1987-2000

	1987-1993	1993-2000	1987-2000
Fuel Oil Consumption	1.92%	0.98%	1.41%

Source: Derived from Annual Energy Outlook (1989)

The slow growth scenario suggested by these projections, does not agree with the expectations of the non-utility firm which receives fuel oil shipped through Canaveral Harbor. Coastal Fuels cited expectations of five percent annual growth through the year 2000. However, in the absence of convincing historical evidence to support higher levels of growth at Canaveral, more credence was given to the national level projection. Correlation and regression analyses showed that trends in Canaveral Harbor tonnage tend to be related to the national level trend. For these reasons, the national level projections were used as the basis for projecting future transportation and industrial fuel oil tonnage for Canaveral.

The non-utility tonnage (140,000 tons) was used as the basis for projecting the future transportation and industrial tonnage. The DOE's fuel oil consumption growth rates were applied to the 1987 tonnage to project tonnage in future years. The DOE projection extends only to the year 2000. Tonnage was held constant after 2000, both because of the limits of the projection and in recognition of the trend toward stable tonnage at the national level implied by the decrease in the annual growth rate after 1993.

The projections of utility and non-utility tonnage are shown in table F-12. The total projected fuel oil receipts for Canaveral are also shown as the sum of utility and non-utility tonnage.

TABLE F-12

PROJECTED FUEL OIL RECEIPTS
MOST LIKELY FUTURE
CANAVERAL HARBOR
1993 - 2043

	Utility	Non-Utility	Total
1993	644,000	157,000	801,000
2003	875,000	168,000	1,043,000
2013	875,000	168,000	1,043,000
2023	875,000	168,000	1,043,000
2033	875,000	168,000	1,043,000
2043	875,000	168,000	1,043,000

BUILDING CEMENT

Historical Trends.

Cement imports have traditionally been a relatively low proportion of total cement consumption in the U.S. In the last several years, beginning in 1984, the proportion of total cement imports relative to consumption in the U.S. has increased substantially. The increase in U.S. cement imports (shown in table F-13, along with imports to the Miami and Tampa Customs Districts and Canaveral Harbor) has been characterized by an influx of cement from Mexico. Imports of cement from Mexico have increased by approximately 500 percent since 1983. Imports from Spain have increased by almost 300 percent during the same period.

TABLE F-13

BUILDING CEMENT - HISTORICAL IMPORTS
U.S., MIAMI AND TAMPA CUSTOMS DISTRICTS AND CANAVERAL

	U.S. Total	Miami/Tampa Customs Districts Imports	Canaveral Harbor Imports
1975	3,702,000	851,000	88,200
1976	3,107,000	641,000	251,500
1977	4,016,000	656,000	170,000
1978	6,597,000	874,000	762,600
1979	9,413,000	1,390,000	391,500
1980	5,263,000	1,278,000	408,800
1981	3,997,000	1,030,000	517,000
1982	2,929,000	709,000	363,000
1983	4,268,000	905,000	226,900
1984	8,846,000	2,267,000	780,000
1985	14,487,000	3,212,000	796,700
1986	16,319,000	3,742,000	808,000
1987	17,726,000	3,636,000	610,500

Over 50 percent of the cement consumed in Florida is imported through the State's two customs districts, Miami and Tampa. Before 1984 cement imports into Florida were usually less than 1.0 million tons per year. Florida cement imports have increased by approximately 300 percent since 1983. The bulk of the increase in cement imports is accounted for by tonnage from Mexico. The nations of Mexico, Spain and Venezuela collectively account for almost three-quarters of imported cement in Florida.

Table F-14 indicates cement import trends for the Miami and Tampa customs districts from Mexico, Spain, Venezuela, Colombia and the Bahamas. The Tampa customs district includes Canaveral Harbor, Jacksonville and Tampa. Before the mid-1970's the volume of imported cement through the Miami district was approximately equivalent to the volume of imports into the Tampa district. Since 1976 imported cement tonnage through the Tampa district has exceeded tonnage through the Miami district. Since the mid-1980's the volume of imported cement through the Tampa district has grown substantially more than the Miami district.

TABLE F-14

BUILDING CEMENT - HISTORICAL IMPORTS BY COUNTRY OF ORIGIN MIAMI AND TAMPA CUSTOMS DISTRICTS

MIAMI CUSTOMS DISTRICT

	Total Imports	Mexico	Spain	Venezuela	Colombia	Bahamas
1975	443,000	22,000	119,000	0	0	56,000
1976	248,000	36,000	112,000	0	0	0
1977	222,000	130,000	23,000	0	0	63,000
1978	281,000	103,000	27,000	0	0	127,000
1979	528,000	79,000	65,000	0	31,000	303,000
1980	596,000	113,000	122,000	0	54,000	255,000
1981	325,000	0	211,000	0	47,000	4,000
1982	246,000	6,000	146,000	0	0	38,000
1983	443,000	175,000	146,000	57,000	39,000	0
1984	798,000	279,000	284,000	230,000	0	2,000
1985	1,225,000	333,000	272,000	579,000	23,000	8,000
1986	1,289,000	319,000	464,000	445,000	0	58,000
1987	1,404,000	323,000	447,000	428,000	0	50,000

TAMPA CUSTOMS DISTRICT

	Total Imports	Mexico	Spain	Venezuela	Colombia	Bahamas
1975	408,000	103,000	61,000	0	0	202,000
1976	393,000	124,000	158,000	0	0	0
1977	434,000	130,000	43,000	0	0	27,000
1978	593,000	141,000	72,000	0	0	109,000
1979	862,000	42,000	73,000	0	0	90,000
1980	682,000	10,000	78,000	0	0	44,000
1981	705,000	0	64,000	0	0	0
1982	463,000	6,000	96,000	0	0	19,000
1983	462,000	74,000	192,000	0	25,000	0
1984	1,469,000	362,000	565,000	414,000	10,000	0
1985	1,987,000	862,000	401,000	230,000	286,000	0
1986	2,453,000	1,066,000	369,000	366,000	363,000	4,000
1987	2,318,000	1,167,000	321,000	136,000	286,000	0

Cement imports increased by about 200 percent between 1983 and 1987 in the Miami district, compared to a 400 percent increase through the Tampa district. While tonnages through Canaveral Harbor have increased (disregarding an apparent discrepancy in the reported tonnage for 1978) the Port's overall market share has declined. The data indicate that cement tonnages imported through Canaveral Harbor have constituted as much as three-quarters of the Tampa customs district in the early 1980's. In spite of increased cement imports through Canaveral Harbor until 1987, the Port's share of Tampa customs district total cement imports declined to approximately one-third in 1986.

Canaveral Harbor market share of imported cement tonnage in Florida has diminished at the same time as the overall volume of imported tonnage into the state through the Tampa district has increased substantially. In real terms, Canaveral Harbor cement tonnage has not kept abreast of trends in Florida and the Tampa district. Although Canaveral Harbor cement tonnage has increased, the rate of growth has been much slower than total imports and cement shipments in Florida.

Correlations.

The tremendous growth in Tampa customs district cement imports and the declining market share at Port Canaveral relative to total imports had an adverse impact on time series causal analysis of cement tonnages. The coefficient of determination (R^2) between Canaveral cement imports (independent variable) and Tampa customs district imports was 0.61. The R^2 for Canaveral cement between 1982 and 1986 and total Tampa customs district imports from Mexico was slightly higher, 0.69. The R^2 statistics for Spain and Venezuela cement imports were 0.44 and 0.13, respectively.

Multiple regressions for the volume of cement imports through Canaveral harbor as a function of Tampa customs district cement imports from Mexico and Spain for the period 1983 through 1987 yielded an R^2 0.998. Both Mexico and Spain coefficients were significant. Other multiple correlations between Canaveral Harbor cement and imports from Mexico, Spain and Venezuela in the Miami customs district or the combined Miami and Tampa districts were insignificant.

Attempts to relate Canaveral cement import tonnage to combined cement tonnages for the Tampa and Miami districts were unsuccessful. The R^2 for Canaveral and combined customs districts total cement imports was 0.41. The R^2 statistics for Mexico, Spain and Venezuela combined imports were 0.72, 0.46 and 0.92 respectively. The relatively high correlation between Florida cement imports from Venezuela and Canaveral cement tonnage is perceived to be spurious due to the small share of total Venezuela cement imports in Florida and Port Canaveral.

In general a relationship should exist between cement and construction activity. OBERS statistics for Florida construction activity, personal income, and employment were regressed against Florida cement imports. The relationship between Florida cement imports (dependent variable) and Florida construction personal income and Florida construction employment indicated R^2 statistics of 0.97 and 0.75 , respectively. Similar correlations between Canaveral cement imports and total Florida construction income and employment yielded R^2 results of 0.01 for both variables.

Correlations using more disaggregate OBERS time series did not yield much improvement in those results. The R^2 statistics for the trend of Canaveral cement imports and construction personal income in the Melbourne, Titusville, Palm Bay Economic Area (EA) were 0.10 and 0.12, respectively. The coefficients of determination between Canaveral Harbor cement imports and construction income and employment in combinations of Florida EA's contiguous to Port Canaveral were not substantially higher than only using the Melbourne EA.

Interviews.

Telephone interviews were conducted to assess trends in cement imports, particularly from Mexico, and tonnage through Canaveral Harbor. A representative of the Portland Cement Association indicated that total annual U.S. imports of cement were expected to remain about the same in the future, approximately 17 million tons annually. A representative of the U.S. Department of commerce stated that Mexican imports were not expected to increase significantly.

Operators of the two cement terminals at Canaveral, Rinker Concrete and Continental Cement were also interviewed. A spokesman for Rinker estimated 1989 cement imports tonnage for his company to be 425,000 tons through its Canaveral facility. He indicated that the market area for cement distribution for Canaveral extends south to Jupiter or Stewart, west to Orlando and north to Ormond Beach. Rinker has facilities at port Everglades and Miami to more efficiently serve south Florida. Rinker expects Mexico, Venezuela and Colombia to continue to be important sources of imports, as ocean sailing times and resulting freight rates are generally lower for those countries than for more traditional sources of supply such as Europe and Canada. The company spokesman indicated that cement handled through Canaveral has decreased in the past two years; however, Rinker expects imports to increase from 425,000 tons in 1989 to 500,000 tons in the near future.

A spokesman for Continental Cement indicated that he expected imports to continue to account for a large share of cement used in Florida. The major markets for Continental's Canaveral Harbor facility were described as Brevard, Orange, Seminole, Volusia and Indian River Counties. Continental expects to imports 350,000 tons per year this year.

Projections.

Future cement imports were projected based on 1985 OBERS projected growth rates for construction earnings in the combined Melbourne, Titusville, Palm Bay, and Orlando EA's applied to current tonnage. The growth rates were derived from the 1985 OBERS BEA Regional Projections and are shown in table F-15.

TABLE F-15

OBERS PROJECTIONS - CONSTRUCTION EARNINGS
1990 - 1995

(millions of dollars)

	1990	1995	2000	2005	2015	2035
Melbourne-Titusville-Palm Bay EA	105.9	123.5	140.6	155.9	179.0	224.8
Orlando EA	367.2	413.4	461.1	505.3	571.3	703.1
Total	473.1	536.9	601.7	661.2	750.3	927.9
			Average Annual Growth Rate (percent)			
Melbourne-Titusville-Palm Bay EA	6.87	3.12	2.63	2.09	1.39	1.15
Orlando EA	5.53	2.40	2.21	1.85	1.24	1.04
Total	5.82	2.56	2.31	1.90	1.27	1.07

The final step in projection of future cement imports to Canaveral was to identify the proportion of total tonnage attributable to each country of origin. Table F-16 shows the derivation of the proportions for imports for 1988 imports. Those proportions were then applied to the projection of total cement imports to calculate the projected tonnage by country of origin shown in Table F-17.

TABLE F-16

CANAVERAL HARBOR IMPORTS OF CEMENT
BY COUNTRY OF ORIGIN - 1988

Origin Country	Mexico	Mexico	Colombia	Venezuela	Other
Origin Port	Tampico	Vera Cruz	Cartagena	Pertigalete	N/A
Receipts	21,370	13,440	8,594	24,000	10,405
	29,092	7,711	40,451	8,165	11,000
	11,053	41,266	34,184	13,500	19,366
	24,176		110,448	8,165	293
	57,376		50,407	6,227	6,083
	7,000			34,882	
	16,950			5,443	
	37,504			5,400	
				7,510	
Total Tons	204,521	62,417	244,084	113,292	47,147
Percent	30.5%	9.3%	36.4%	16.9%	7.0%

TABLE F-17

PROJECTED IMPORTS OF CEMENT BY PORT OF ORIGIN 1993 - 2043

	1993	2003	2013	2023	2033	2043
Tampico, Mexico	271,500	338,700	389,100	434,500	488,300	543,000
Vera Cruz, Mexico	82,800	103,300	118,600	132,500	148,900	165,600
Cartagena, Colombia	324,000	404,200	464,400	518,500	582,800	648,100
Pertigalete, Venezuela	150,400	187,600	215,600	240,700	270,600	300,900
Other	61,400	76,600	88,000	98,300	110,500	122,800
TOTAL	890,100	1,110,400	1,275,700	1,424,500	1,601,100	1,780,400

SCRAP METAL

Historical Trends.

Exports of shredded scrap from Canaveral Harbor have risen dramatically since shipments were first made in 1974. Shredded scrap is used to manufacture steel. World steel production has been growing slowly during the time that shredded scrap has been exported from Canaveral. The major trends in steel production are a decline in output by industrialized nations, such as the U.S. and Japan, and a rapid increase in production by industrializing nations, such as Korea and Turkey.

Table F-18 shows total scrap exports and shredded scrap exports for the U.S. and shredded scrap exports for Canaveral for 1970 to 1987. Total U.S. scrap exports and shredded scrap exports have fluctuated with recurring high and low values, indicating a cyclical market steel and corresponding cyclical demand for export scrap. Canaveral Harbor scrap exports indicate fluctuations also, peaking at 131,100 tons in 1978 and again in 1984, 1986 and 1987. Overall, U.S. scrap exports have increased, however, the cyclical nature of exports distorts average annual demand trends. U.S. shredded scrap exports had average annual compound growth rates of 8.84 percent and 9.50 percent in two cycles spanning 1974 to 1980 and 1981 to 1987, respectively. The average annual growth rate for the entire period from 1974 to 1987 was 3.96 percent. U.S. shredded scrap exports have been relatively volatile in the two cyclical periods from 1974 to 1987. The average annual compound growth rate for U.S. shredded scrap exports from 1975 to 1987 was 2.69 percent. The rate of growth for Canaveral Harbor exports for the same period was 9.2 percent.

TABLE F-18

U.S. AND CANAVERAL SCRAP EXPORTS
1970 - 1987

	Total Scrap (U.S.)	Shredded Scrap (U.S.)	Shredded Scrap (Canaveral)
1970	10,111,000	1,165,000	0
1971	6,082,000	1,026,000	0
1972	7,177,000	1,463,000	0
1973	10,874,000	2,098,000	0
1974	8,497,000	1,999,000	9,700
1975	9,442,000	2,409,000	61,600
1976	7,877,000	2,179,000	70,900
1977	5,854,000	1,606,000	45,600
1978	9,039,000	2,684,000	131,100
1979	11,054,000	2,980,000	84,000
1980	11,168,000	3,323,000	70,400
1981	6,415,000	1,923,000	86,600
1982	6,804,000	2,023,000	98,000
1983	7,520,000	2,029,000	53,400
1984	9,498,000	2,775,000	136,200
1985	9,950,000	2,559,000	101,600
1986	11,704,000	3,495,000	155,600
1987	10,637,000	3,314,000	177,100

Historical exports to major nations of destination for U.S. scrap are shown in table F-19. U.S. scrap exports to industrializing nations, such as Korea and Turkey, have increased by 100 and 200 percent, respectively, since 1983. Traditional scrap markets, such as Japan, have declined while exports to non-industrial nations, denoted as "other" in table F-19, have increased.

TABLE F-19

UNITED STATES SCRAP EXPORTS BY COUNTRY OF DESTINATION
1971 - 1987

(thousands of tons)

	U.S. Total	Japan	Korea	Turkey	Greece	Spain	Other
1971	6,082	1,744	324	73	37	610	19
1972	7,177	2,309	380	125	163	721	43
1973	10,874	4,666	739	124	187	1,127	18
1974	8,497	2,980	680	57	113	896	43
1975	9,442	2,405	762	89	161	1,709	31
1976	7,877	1,256	911	159	222	1,862	1,124
1977	5,854	1,036	1,441	310	300	784	496
1978	9,039	3,190	1,503	258	340	744	708
1979	11,054	2,922	1,418	242	500	1,400	1,077

TABLE F-19 (continued)

UNITED STATES SCRAP EXPORTS
BY COUNTRY OF DESTINATION
1971 - 1987

(thousands of tons)

	U.S. Total	Japan	Korea	Turkey	Greece	Spain	Other
1980	11,168	2,838	1,736	318	545	1,163	762
1981	6,415	1,191	1,241	364	271	434	874
1982	6,804	1,530	1,522	639	208	868	987
1983	7,520	2,600	1,476	700	112	356	754
1984	9,498	2,680	1,833	807	125	608	1,471
1985	9,950	2,110	1,978	955	0	910	1,373
1986	11,704	1,725	2,989	1,417	0	673	2,441
1987	10,367	986	2,630	2,254	0	417	2,247

Source: U.S. Department of the Interior, Minerals Yearbook, Volume 1.

Historical imports of scrap metal by major importing nations is shown in Table F-20. The relative maturity of the steel industry in each nation can be inferred from the trends in scrap imports. Japanese scrap imports have been relatively stagnant since the early 1970's; however, Korean and Turkish scrap imports have increased greatly. U.S. exports represent less than 10 percent of total scrap consumption in Japan. In Korea and Turkey, U.S. scrap exports make up more than 50 percent of consumption. Clearly, Korea and Turkey constitute major markets for U.S. scrap.

TABLE F-20

SCRAP IMPORTS
BY COUNTRY OF DESTINATION
1971 - 1986

(thousands of tons)

	Japan	Korea	Turkey	Greece	Spain
1971	2,813	832	114	17	1,523
1972	2,755	573	120	106	2,012
1973	5,962	888	206	164	2,218
1974	3,923	1,235	130	26	2,122
1975	3,409	930	94	108	2,399
1976	1,936	1,206	260	88	2,930
1977	1,587	1,732	331	103	2,197
1978	3,559	1,867	356	218	2,811
1979	3,688	1,742	399	254	3,805
1980	3,291	2,130	381	263	4,835

TABLE F-20 (continued)

SCRAP IMPORTS
BY COUNTRY OF DESTINATION
1971 - 1986

(thousands of tons)

	Japan	Korea	Turkey	Greece	Spain
1981	1,974	2,546	579	317	4,479
1982	2,232	1,994	825	478	5,249
1983	4,306	2,090	1,184	573	5,227
1984	4,429	2,294	1,144	362	5,[illegible]1
1985	3,587	2,640	1,323	945	6,775
1986	3,554	3,434	1,988	502	7,292

Source: U.S. Department of the Interior, Minerals Yearbook, Volume 1.

Correlations.

Most of the scrap exported through Canaveral is shredded scrap. Correlations between U.S. shredded scrap (dependent variable) and total scrap exports had R^2's of 0.51 for the period 1970 through 1987 and 0.89 for the period 1982 through 1987. Correlations for Canaveral scrap exports as a function of U.S. shredded exports over the same periods had R^2's of 0.46 and 0.82, respectively. Strong foreign demand for U.S. scrap, particularly shredded scrap, has benefited Canaveral.

Efforts to demonstrate a strong relationship between Canaveral scrap exports and foreign steel production were successful; however, R^2 statistics for steel production of individual nations were weak. Correlations between U.S. shredded scrap exports (dependent variable) and foreign steel production were consistently high, with R^2's of 0.80 for the period 1970 to 1987 and 0.76 for 1982 to 1987. Weak correlations existed between Canaveral scrap exports and scrap imports for major national markets of the port. The R^2 statistics for Canaveral scrap exports and Korean scrap imports for the periods 1974 to 1987 and 1982 to 1986 were 0.66 and 0.69, respectively. Correlations of Canaveral scrap exports and Turkish imports for the same periods had R^2's of 0.62 and 0.61. The correlation between Canaveral scrap exports and scrap imports from by "other" nations, not otherwise identified by name because of insignificance, was high. For the period 1974 to 1986 the R^2 was 0.73. For the period 1982 to 1986 the R^2 was 0.84.

Interviews.

Interviews were conducted with spokesmen for the Canaveral Port Authority, U.S. Department of Commerce, industry trade associations, and the major scrap supplier near the port. The Port's Director of Marketing indicated that the major scrap export markets were as follows, in order of importance: (1) Korea; (2) Turkey; (3) Yugoslavia; (4) Greece; and (5) Spain. While there are multiple shippers of record, there is only one supplier of scrap, Yorke Doliner & Company.

The U.S. Department of Commerce did not provide forecasts of world production or demand. Their spokesman indicated that world steel production is expected to grow at an average annual rate of three percent for emerging nations and one percent for developed nations. The major consumers of scrap exported from Canaveral Harbor, Korea and Turkey, are expanding their steel producing capabilities along different dimensions. Korea is expected to increase steel capacity by two million tons per year beginning in 1990 or 1991. Turkey is in the process of converting flat roller capacity to have the capability to produce rods and bars which are now imported. Turkey is expected to remain a net consumer of steel, relying on imports unless it can secure financing for new capacity. Overall, steel exports will follow the trends in production.

A spokesman for the Institute of Scrap Recycling Industries, Inc. stated that scrap exports were a safety valve for weak domestic demand. Scrap as a commodity moves where the net return to the seller is highest. Fluctuations in U.S. exchange rates and higher levels of world steel demand have favorably impacted a strong world market.

Yorke Doliner & Company's spokesman indicated that they expect the continued growth in the market for scrap; however, future growth will be constrained by the availability of scrapped automobiles and trucks. The company expects to produce about 250,000 tons of scrap annually, in the future. Currently they are crushing about 600 autos daily, which works out to approximately 3,000 tons of auto scrap per week. Automobiles represent about 80 percent of recyclable steel produced by the company. Major markets for the company's scrap are located in Korea, Turkey and India. Turkey is the most important market for the shredded scrap produced by the company.

The company cannot expand its output much more due to the constraining factors of the supply of scrap vehicles and the capacity of the firm's crushing machine. The firm estimates capacity of the existing facilities at Canaveral at 250,000 tons per year.

Projections.

The cyclical nature of scrap exports from Canaveral is evident. Scrap exports from Canaveral have increased at phenomenal rate of growth during the most recent cycle, particularly from 1984 to 1988. Exports in the range of 200,000 tons a year are approaching the 250,000 ton annual capacity of the scrap facilities at Canaveral. Exports in the 200,000 to range also coincide with strong U.S. export markets because of high levels of foreign demand and favorable currency exchange rates.

The cyclical nature of scrap exports is indicated in table F-7. The last two cycles, spanning the period 1974 to 1987, indicate that exports reflected a pattern of high growth in the cycle (8.84 percent per year from 1974 to 1980 and 9.5 percent per year, in the current cycle, from 1981 to 1987), but lower growth overall, 3.96 percent from 1974 to 1987.

U.S. scrap exports grew at an average annual rate of 2.69 percent from 1974 to 1986. This sustained rate of growth is consistent with observed rates of growth for scrap consumption by major foreign markets for U.S. scrap in Korea and Turkey. Scrap consumption in Korea and Turkey increased at an annual rate of 3.64 percent from 1982 to 1986. Consumption in Turkey increased at an average annual rate of 2.37 percent from 1980 to 1986.

Applying either the 3.64 percent or the 2.37 percent growth rate to the estimated level of Canaveral harbor scrap tonnage in 1990, 225,000 tons, results in phenomenal levels of export tonnage as shown in table F-21. The tonnages are clearly beyond the capacity of the local supplier after 1993. Moreover, the data in table F-21 do not reflect intuitive adjustments for cyclical trends in steel production and scrap consumption.

TABLE F-21

PROJECTED SCRAP EXPORTS
UNCONSTRAINED BY CAPACITY
1990 - 2043

	Optimistic (3.64% Growth)	Most Likely (2.69% Growth)	Pessimistic (2.37 % Growth)
1990	225,000	225,000	225,000
1993	250,500	243,700	241,400
2003	358,100	317,700	305,100
2013	512,100	414,300	385,600
2023	732,100	540,300	487,400
2033	1,084,900	723,500	630,600
2043	1,551,200	943,400	797,100

The observed cycles in U.S. scrap exports indicate that tonnage has virtually doubled over the last two business cycles, 1974 to 1980 and 1981 to 1987. Tonnage fluctuations exceeding minus 50 percent to plus 100 percent can also be observed at Port Everglades. Table F-11 incorporates observed cyclical trends in scrap exports into the unconstrained long run projection. With current U.S. scrap exports at record levels due to strong foreign demand and a favorable currency exchange rate, the current situation is probably near the peak of the cycle. It would appear that Canaveral Harbor would not be able to sustain the current high level of imports over the next cycle. To adjust for this, three scenarios were projected, (1) optimistic; (2) most likely; and (3) pessimistic.

The optimistic and pessimistic scenarios reflect the upper and lower ranges of scrap demand or relatively high and low points in the business cycle. Table F-22 is based on the trend in unconstrained scrap exports. The optimistic projection remains identical to the non-cyclical projection in table F-21. Pessimistic projections represent the bottom of the business cycle by halving the pessimistic non-cyclical projection in table F-21. The most likely projection represents the mid-point in the business cycle by taking 75 percent of the non-cyclical most likely projection in table F-21.

TABLE F-22

PROJECTED SCRAP EXPORTS
UNCONSTRAINED BY CAPACITY
WITH CYCLICAL ADJUSTMENT
1990 - 2043

	Optimistic	Most Likely	Pessimistic
1990	225,000	225,000	225,000
1993	250,500	182,700	120,700
2003	358,100	238,300	152,500
2013	512,100	310,700	192,800
2023	732,100	405,200	243,700
2033	1,084,900	542,600	315,300
2043	1,551,200	707,600	398,500

The optimistic projection in table F-22 essentially reflects a future scenario in which the long term rate of Canaveral Harbor scrap exports remains high and is not adversely affected by the observed fluctuations in tonnage at the port and for the nation as a whole. The pessimistic projection reflects a future in which the long term growth rate is low and the business cycle is depressed relative to the current environment for U.S. and Canaveral Harbor scrap exports. The most likely projection reflects a future in which scrap exports continue to enjoy a moderate overall rate of growth and the level of scrap exports over time reflects the average of the business cycle.

Projected scrap exports constrained by capacity are shown in table F-23. That set of projections incorporates the upper limit of the scrap generating capacity of Yorke Doliner & company, 250,000 tons annually, as the constraint on future exports. Under the most likely business scenario the capacity constraint is not achieved until 2003. Under the optimistic (sustained high export demand) scenario capacity is reached in 1993, the first year of the projection. Under the most pessimistic scenario, capacity is not achieved until 2023.

The projections in table F-23 assume no increase in scrap processing capability within the market area for the port. The projections also assume no diversion to the port from deepening or potential environmental changes at other ports such as Tampa or Port Everglades, where space currently devoted to maintaining scrap stockpiles could potentially be used for other, higher value added commodities.

TABLE F-23

PROJECTED SCRAP EXPORTS
CONSTRAINED BY CAPACITY
WITH CYCLICAL ADJUSTMENT
1990 - 2043

	Optimistic	Most Likely	Pessimistic
1990	225,000	225,000	225,000
1993	250,000	182,700	120,700
2003	250,000	238,300	152,500
2013	250,000	250,000	192,800
2023	250,000	250,000	243,700
2033	250,000	250,000	250,000
2043	250,000	250,000	250,000

The final step in projecting future scrap tonnage at Canaveral was to disaggregate the total tonnage projection by country of destination. Half of the total tonnage was allocated to Korea and half to Turkey, the two major consumers of scrap exported from Canaveral. The flexibility of the scrap export market is reflected in the allocation of an equal amount of tonnage to each destination. The resulting projection for the most likely future scenario is shown in table F-24.

TABLE F-24

PROJECTED SCRAP EXPORTS
MOST LIKELY FUTURE
BY COUNTRY OF DESTINATION
1990 - 2043

	1993	2003	2013	2023	2033	2043
Korea	91,400	119,200	125,000	125,000	125,000	125,000
Turkey	91,400	119,200	125,000	125,000	125,000	125,000

TOTAL PROJECTED TONNAGE

The projections of individual commodities future tonnage were summed, along with a projection of "other commodities" tonnage to generate a projection of total tonnage for Canaveral Harbor over the 50-year period of analysis. "Other commodities" tonnage is defined as all tonnage which is not included in one of the four major commodity groups. Included in that category are such commodities as citrus fruits and juices, newsprint, lumber, salt and gypsum. Those commodities generally are moved in relatively small shipments aboard vessels which can call at Canaveral Harbor fully loaded under the without project condition. For the past ten years "other commodities" tonnage has ranged from 10 percent to 26 percent of total tonnage at Canaveral, averaging 16 percent. Coincidentally, the "other commodities" tonnage for the most recent year of data, 1987, was also 16 percent of the total. "Other commodities" tonnage was projected to remain at 16 percent of the total Canaveral Harbor tonnage throughout the period of analysis.

The total tonnage shipped through Canaveral Harbor is projected to increase from 2,789,000 tons in 1993 to 4,254,000 tons in 2043. Most of the increase in tonnage is expected to occur in the first ten years of the period of analysis, as total tonnage is projected to increase by two-thirds of a million tons (667,000) between 1993 and 2003. An increase of four-fifths of a million tons (800,000) is projected for the forty-year period after 2003. The projected total tonnage is shown in table F-25.

TABLE F-25

PROJECTED TOTAL TONNAGE
MOST LIKELY FUTURE
BY COMMODITY GROUP
1990 - 2043

	Gasoline	Fuel Oil	Building Cement	Scrap Metal	Other	TOTAL
1993	400,000	801,000	890,100	182,700	446,200	2,720,000
2003	650,000	1,043,000	1,110,400	250,000	553,000	3,606,400
2013	830,000	1,043,000	1,265,700	250,000	582,600	3,971,300
2023	830,000	1,043,000	1,424,500	250,000	612,900	4,160,400
2033	830,000	1,043,000	1,601,100	250,000	646,500	4,370,600
2043	830,000	1,043,000	1,780,400	250,000	680,600	4,584,000

VESSEL ANALYSIS

It was necessary to identify and analyze historical fleets of cargo-carrying ocean-going vessels calling on Canaveral Harbor and to project future fleets for those vessels, in order to estimate potential transportation cost savings associated with channel improvements. The first step in that process was to identify the vessels calling at Canaveral Harbor in recent years (1987-1988).

Current Fleets

Existing data for cargo-carrying ships calling at Canaveral Harbor were compiled from sources including the Canaveral Port Authority, Canaveral Harbor Pilots and Lloyd's Register of Shipping. Those data were entered into an electronic database. Information collected for each vessel includes its name, date of arrival, dimensions (i.e. length, width, deadweight tonnage, maximum draft, arrival draft and departure draft), type (i.e. tanker, dry bulk, refrigerated cargo, etc.), flag of registry and terminal at which it docked. Table F-26 shows an example of several database records detailing the information recorded.

TABLE F-26

EXAMPLE OF VESSEL DATABASE
EXISTING FLEET - TANKERS
CANAVERAL HARBOR

DATE	NAME	DWT	WIDTH	DMAX	DIN	DOUT	BERTH	LGTH	REGISTRY
01-01-88	PASTAZA	31,543	92	34	28	24	TB-2	580	ECQUADOR
01-03-88	PECOS	28,851	83	34	25	22	TB-1	628	US
01-07-88	COASTAL MANATEE	31,285	84	35	26	23	TB-1	644	US
01-16-88	COASTAL MANATEE	31,285	84	35	26	22	TB-1	644	US
01-23-88	CIELO DI SALERNO	29,912	85	36	28	28	TB-1	561	ITALY
02-02-88	PECOS	28,851	83	34	25	23	TB-1	628	US
02-11-88	COASTAL MANATEE	31,285	84	35	27	22	TB-1	644	US
02-13-88	PECOS	28,851	83	34	33	30	TB-1	628	US
02-20-88	CENTAURUS	31,600	86	37	29	22	TB-1	560	ITALY
02-21-88	COASTAL MANATEE	31,285	84	35	27	21	TB-1	644	US
03-02-88	BIRDIE	67,228	110	40	34	26	TB-2	780	LIBERIA
03-03-88	COASTAL MANATEE	31,285	84	35	27	22	TB-1	644	US
03-06-88	POMEROL	31,857	84	35	32	24	TB-2	640	US
03-11-88	PECOS	28,851	83	34	30	29	TB-1	628	US
03-14-88	COASTAL MANATEE	31,285	84	35	27	22	TB-1	644	US
03-16-88	PECOS	28,851	83	34	25	22	CWW	628	US
03-20-88	MORMAC STAR	39,861	90	35	33	25	TB-1	689	US
04-09-88	PECOS	28,851	83	34	22	23	TB-1	628	US
04-11-88	MOBILE BAY	32,339	84	35	28	27	TB-1	641	US
04-16-88	COLORADO	31,081	74	35	33	23	TB-2	685	US
04-20-88	COASTAL MANATEE	31,285	84	35	26	22	TB-1	644	US
04-22-88	MOBILE BAY	32,339	84	35	29	27	TB-1	641	US
04-27-88	PECOS	28,851	83	34	29	26	TB-1	628	US
05-06-88	COASTAL MANATEE	31,285	84	35	32	26	TB-1	644	US
05-07-88	PECOS	28,851	83	34	35	30	TB-2	628	US
05-28-88	COASTAL MANATEE	31,285	84	35	33	25	TB-1	644	US
06-09-88	PECOS	28,851	83	34	34	30	TB-1	628	US
06-24-88	TORM ROTNA	33,650	85	38	22	23	TB-1	560	DENMARK

The vessel database was used in conjunction with interviews with harbor users to develop a profile of the current fleet. The current fleet for each of the four major commodity groups was identified. Those fleets became the basis for projection of future fleets. Current and future fleets by commodity group are discussed in the following sections.

GASOLINE

Current Fleet

Gasoline shipped to Canaveral is received by Coastal Fuels Marketing, Inc. Vessels ranging from 32,000 to 40,000 deadweight tons are currently used to transport gasoline. The Coastal Manatee is typical of the smaller vessels, at 31,285 deadweight tons, 644 feet in length by 85 feet in beam by 35 feet maximum draft. The Coastal Manatee called at Canaveral Harbor 14 times in 1988. The ship is owned by the Coastal Corporation, the corporate parent of Coastal Fuels Marketing.

The Perseverence is typical of the largest vessels used to transport gasoline to Canaveral. Her dimensions are 39,988 deadweight tons, 610 feet in length by 90 feet in beam by 40 feet maximum draft. The Perseverence called at Canaveral harbor only once in 1988, however; other vessels of similar dimensions called on three other occasions.

Of the 25 vessel calls in 1988 associated with gasoline movements, 18 were by United States flag vessels. Review of the historical data also revealed that, of the 172,300 tons of gasoline imported to Canaveral in 1988, 111,400 tons were shipped aboard U.S. flag vessels and 60,900 tons were on foreign flag vessels. A single firm, Coastal Fuels Marketing (a subsidiary of the Coastal Corporation) receives all of the gasoline shipped to Canaveral.

The Coastal Corporation is a vertically integrated multi-national corporation which owns five vessels used to transport gasoline and fuel oil. All five of those vessels (the Solar, Spray, Coastal Manatee, Coastal Eagle Point, and Coastal Corpus Christi) are U.S. flag of registry. In addition, Coastal Corporation has time charter agreements for five other vessels (the Concho, Pecos, Ocean Spirit, Front Eagle and Uranus) all of which are also U.S. flag of registry.

Coastal uses all U.S. flag vessels to preserve the flexibility to use the same vessels in either U.S. or foreign trades, and in so doing maximize the utilization of the vessels it owns and charters. It should be noted that transportation costs (and more importantly, the difference in operating costs for U.S. versus foreign flag vessels) are a small component of the delivered cost of gasoline. Based on discussion with representatives of Coastal Corporation, maximization of vessel utilization is the focus of their efforts to minimize delivered costs.

Based on the preponderance of U.S. flag vessels in the existing fleet and the considerations discussed above, both with and without project fleets are assumed to be U.S. flag of registry. Accordingly, U.S. flag vessel operating costs were used throughout the analysis of gasoline transportation costs and savings.

Without Project Fleet

The without project gasoline fleet is based on the vessels which called in 1988, or vessels of similar dimensions, continuing to transport the projected gasoline tonnage to Canaveral in future. The number of vessel calls was increased to reflect the projected increase in gasoline tonnage. The projected gasoline fleet without project is shown in table F-27.

TABLE F-27

FUTURE GASOLINE FLEET
WITHOUT PROJECT
1993 - 2043

	1993	2003	2013	2023	2033	2043
25-30,000 dwt	19	30	39	39	39	39
30-34,000 dwt	2	4	5	5	5	5
34,000 dwt+	2	4	5	5	5	5
Total	23	38	49	49	49	49

With Project Fleets

Vessel calls were increased proportionally with the projected increase in gasoline tonnage. This method of projecting future fleets preserved the existing fleet distribution by size class, which is not expected to change with project. With a deeper channel, the Coastal Manatee would be able to call at Canaveral Harbor fully loaded. Similarly, larger vessels would be able to call at Canaveral more fully loaded than under without project conditions. In addition, the vessels would unload all of their cargoes at Canaveral harbor, no longer unloading part of the cargo at Port Everglades. Both of those factors would cause average shipment size to increase, resulting in fewer vessel calls required to move the projected annual tonnage. The resulting without project projected fleets are shown in table F-28 for a 37-foot channel and in Table F-29 for 39-foot and 41-foot channels.

TABLE F-28

FUTURE GASOLINE FLEET
WITH PROJECT - 37' CHANNEL
1993 - 2043

	1993	2003	2013	2023	2033	2043
25-30,000 dwt	14	23	30	30	30	30
30-34,000 dwt	2	4	5	5	5	5
34,000 dwt+	2	4	5	5	5	5
Total	18	29	40	40	40	40

TABLE F-29

FUTURE GASOLINE FLEET
WITH PROJECT - 39' CHANNEL
1993 - 2043

	1993	2003	2013	2023	2033	2043
25-30,000 dwt	14	23	30	30	30	30
30-34,000 dwt	1	2	2	2	2	2
34,000 dwt+	2	3	4	4	4	4
Total	17	28	36	36	36	36

FUTURE GASOLINE FLEET
WITH PROJECT - 41' CHANNEL
1993 - 2043

	1993	2003	2013	2023	2033	2043
25-30,000 dwt	13	22	29	29	29	29
30-34,000 dwt	1	2	2	2	2	2
34,000 dwt+	2	3	4	4	4	4
Total	17	27	35	35	35	35

FUEL OIL

Current Fleet

Fuel oil shipped to Canaveral is received by Florida Power and Light Company, Orlando Utilities and Coastal Fuels Marketing. In 1988 29 vessel calls, by ships ranging from approximately 29,000 dwt to more than 50,000 dwt were recorded for fuel oil. All but three of the 29 vessel calls were by United States flag vessels. The three foreign flag vessels accounted for the 92,200 tons of fuel oil imported to Canaveral in 1988. For this reason, benefits associated with fuel oil imports were based on foreign flag vessel operating costs. Vessels used to transport domestic fuel oil are U.S. flag of registry, and accordingly U.S. flag vessel operating costs were used in the analysis of fuel oil transportation costs and savings for domestic tonnage. The observed 1988 fleet, adjusted to reflect recent developments in vessel ownership, became the basis for the without project fleet projections.

Without Project Fleet

Of the 29 vessel calls, 15 were by a single 29,000 dwt vessel, the Pecos. That vessel is chartered by the Coastal Corporation. Discussions with spokesmen for Coastal Fuels revealed that the company would like to transport fuel oil in larger shipments than are possible using the Pecos. As stated previously, the Coastal Corporation recently purchased two large (50,000 dwt) vessels. Those vessels, formerly the Exxon Baltimore and Exxon Boston have been renamed the Coastal Corpus Christi and Coastal Eagle Point. Their dimensions are 52,759 deadweight tons, 743 feet in lenght by 102 feet in beam by 39 feet maximum draft. Both of these vessels, like the Pecos, are registered under the U.S. flag. Transportation cost analyses indicated that even without a project it would be less costly to transport fuel oil to Canaveral with these larger vessels than with the Pecos. Because the Pecos is a chartered vessel she can easily be replaced by the newly purchased vessels. Both the without and with project fleets reflect replacement of the Pecos with the larger vessels. Tonnage transported in the past by the smaller Pecos was projected and allocated to the 50,000 dwt vessel class. Other than this change, the distribution of vessels by size class was held constant. The resulting without project projected fleets are shown in table F-30.

TABLE F-30

FUTURE FUEL OIL FLEET
WITHOUT PROJECT
1993 - 2043

	1993	2003	2013	2023	2033	2043
30-33,000	10	14	14	14	14	14
33-36,000	1	2	2	2	2	2
36-45,000	3	4	4	4	4	4
45,000+	15	20	20	20	20	20
TOTAL	30	40	40	40	40	40

With Project Fleets

The with project fuel oil fleets were derived from the without project fleets, adjusted to reflect increases in average shipment size associated with increased channel depths. Under without project conditions, loaded drafts are limited to no more than 33 feet. A deeper channel would permit deeper loaded drafts. Deeper loaded drafts are the result of shipping more tonnage on a given vessel (increasing the average shipment size). For each vessel size class, the number of vessels needed to transport a given quantity of tonnage was determined based on average shipment size.

The potential increases in shipment size were confirmed in telephone interviews with the three firms which receive fuel oil shipments at Canaveral Harbor. All three indicated that they would increase shipment sizes if the channel were deepened. The projected tonnage, along with increases in shipment size, were used as the basis for calculating the with project fleets shown in table F-31, 32 and 33.

TABLE F-31

FUTURE FUEL OIL FLEET
WITH PROJECT - 37' CHANNEL
1993 - 2043

	1993	2003	2013	2023	2033	2043
30-33,000	12	12	12	12	12	12
33-36,000	1	2	2	2	2	2
36-45,000	3	4	4	4	4	4
45,000+	12	16	16	16	16	16
TOTAL	25	34	34	34	34	34

TABLE F-32

FUTURE FUEL OIL FLEET
WITH PROJECT - 39' CHANNEL
1993 - 2043

	1993	2003	2013	2023	2033	2043
30-33,000	8	10	10	10	10	10
33-36,000	1	2	2	2	2	2
36-45,000	3	4	4	4	4	4
45,000+	12	16	16	16	16	16
TOTAL	24	32	32	32	32	32

TABLE F-33

FUTURE FUEL OIL FLEET
WITH PROJECT - 41' CHANNEL
1993 - 2043

	1993	2003	2013	2023	2033	2043
30-33,000	7	9	9	9	9	9
33-36,000	1	2	2	2	2	2
36-45,000	3	4	4	4	4	4
45,000+	12	16	16	16	16	16
TOTAL	23	31	31	31	31	31

DRY BULK

Current Fleet

The dry bulk fleet at Canaveral Harbor includes vessels carrying both building cement and scrap metal. In 1988 58 dry bulk vessels called Canaveral Harbor. Of that total, 48 carried building cement and the remaining 10 carried scrap metal. Cement and scrap vessel calls in total have held steady over the past several years, averaging about five calls per month; four by cement carriers and one by a scrap carrier.

Several generalizations about the fleet can be made. The fleet appears consistent with expectations based on the commodity mix and channel depth at Canaveral. Bulk vessels tend towards HandyMax size (25,000-40,000 dwt), a characteristic consistent with more general maritime trends. In comparison with the world dry bulk fleet, the Canaveral fleet exhibits two important distinctions. The vast majority of bulk vessels calling at Canaveral are HandyMax (<40,000 dwt) or smaller. Current vessel sizes of bulk ships are small in comparison to the world bulk fleets.

World Dry Bulk Fleet

Forecasts of the cement and scrap bulk carrier fleet expected to call at Canaveral Harbor were developed by Gulf Engineers and Consultants, (GEC) Inc. by combining forecasted characteristics of the world fleet with the vessel characteristics of the existing cement and scrap fleet calling at Canaveral. The forecasting method adopted explicitly incorporated the following two factors: (1) vessels were drawn from the world fleet, and (2) the trade flows at the port were reflected in the projections. The GEC world dry bulk fleet forecast is shown in table F-34.

TABLE F-34

FORECAST OF WORLD DRY BULK FLEET
BY YEAR AND DWT CATEGORY
1990 - 2045

YEAR	DWT Category Under 10,000	10,000-19,999	20,000-29,999	30,000-39,999	40,000-49,999	50,000-59,999
1990	396	692	1,444	1,071	396	280
1995	352	712	1,400	1,291	607	359
2000	345	593	1,333	1,426	780	425
2005	337	634	1,392	1,533	948	533
2010	335	657	1,450	1,687	1,131	663
2015	328	650	1,478	1,831	1,343	821
2020	345	705	1,620	2,095	1,649	1,053
2025	348	728	1,697	2,285	1,910	1,272
2030	348	745	1,764	2,475	2,193	1,528
2035	372	809	1,930	2,767	2,529	1,805
2040	370	823	1,995	2,972	2,867	2,143
2045	371	843	2,075	3,197	3,234	2,524

YEAR	60,000-79,999	80,000-99,999	100,000-124,999	125,000-149,999	150,000-199,999	>200,000	TOTAL
1990	623	139	204	185	136	52	5,618
1995	744	253	186	217	123	58	6,300
2000	836	365	192	269	162	91	6,816
2005	829	521	272	289	215	136	7,640
2010	902	657	362	344	256	197	8,640
2015	992	833	471	418	315	283	9,764
2020	1,150	1,045	613	504	389	390	11,559
2025	1,292	1,288	788	618	476	530	13,231
2030	1,460	1,580	1,004	763	583	716	15,161
2035	1,674	1,934	1,254	938	715	920	17,648
2040	1,909	2,358	1,586	1,166	879	1,231	20,299
2045	2,188	2,870	1,989	1,451	1,082	1,630	23,453

Source: Compiled by Transportation Research & Analysis Center, Inc.

Without Project Fleet

Dry bulk vessels calling at Canaveral will be selected from the world fleet. Information on the world fleet was combined with the vessel characteristics of the Canaveral fleet to determine future fleet composition at Canaveral. The number of vessel calls was estimated based on the forecast fleet characteristics and the tonnage forecast for dry bulk commodities.

The 1988 Canaveral dry bulk fleet was used as the baseline for projecting the future without project fleet. It is assumed that the draft and tonnage characteristics of the Canaveral dry bulk fleet will change in the same proportions as relevant DWT categories of the world fleet. This determines the Canaveral distribution of tonnage by DWT category for a given year. The estimated tonnage distribution was used to determine the capacity of the "average" dry bulk vessel calling at Canaveral in each year. Total tonnage was divided by the capacity of the "average" vessel to determine the required number of sailings per year. The number of sailings was then distributed by DWT category based on vessel tonnage for each DWT category. Effectively, total dry bulk vessel calls are forecast to grow at the same rate as growth in cement and scrap shipments through Canaveral, adjusted to reflect the changing composition of the world dry bulk fleet.

The allocation of vessel calls by DWT category was transformed into vessel calls by maximum draft using the distribution of maximum drafts of the existing fleet within each of the DWT categories. The distribution of maximum drafts for each DWT category was used to estimate the probability distribution of draft for the dry bulk fleet. The number of vessels forecast to call at Canaveral for each DWT category was multiplied by the probability of the vessel having a maximum draft within a certain range, i.e. 32.00-33.99 feet. This was repeated for all DWT categories. Then the number of vessels within each draft range was summed across DWT classes to estimate vessel calls by two-foot increments beginning with 24 feet. The without project forecasts for dry bulk vessels are shown by DWT class in table F-35 and by maximum draft in tables F-36 and F-37. As expected, the forecast predicts significant growth in dry bulk vessel calls at Canaveral over the period of analysis. Total dry bulk vessels calls are projected to almost double from estimated 1988 levels.

TABLE F-35

FORECAST OF CANAVERAL DRY BULK FLEET BY YEAR AND DWT CATEGORY 1993 - 2043

YEAR	DWT Category Under 10,000	10,000-19,999	20,000-29,999	30,000-39,999	40,000-49,999	TOTAL
1993	2	6	42	13	1	64
1998	2	6	46	16	3	73
2003	2	6	49	19	3	79
2008	2	6	51	20	3	82
2013	2	6	53	21	4	86
2018	2	6	54	23	5	90
2023	2	6	56	25	5	94
2028	2	6	57	27	6	98
2033	2	6	59	28	6	102
2038	2	6	60	30	7	106
2043	2	6	62	32	8	111

Source: Compiled by Transportation Research & Analysis Center, Inc.

TABLE F-36

FORECAST OF CANAVERAL BUILDING CEMENT FLEET
WITHOUT PROJECT
BY YEAR AND MAXIMUM DRAFT
1993 - 2043

MAXIMUM DRAFT	1993	1998	2003	2008	2013	2023	2033	2043
<23.99 ft. (under 10,000 DWT)	2	2	2	2	2	2	2	2
24.00-25.99 ft. (5,000-12,500 DWT)	0	0	0	0	0	0	0	0
26.00-27.99 ft. (7,500-15,000 DWT)	1	1	1	1	1	1	1	1
28.00-29.99 ft. (10,000-20,000 DWT)	2	2	2	2	2	2	2	2
30.00-31.99 ft. (10,000-30,000 DWT)	6	6	6	6	6	7	7	8
32.00-33.99 ft. (20,000-30,000 DWT)	18	20	21	22	23	24	26	27
34.00-35.99 ft. (20,000-50,000 DWT)	18	21	23	24	25	27	29	32
36.00-37.99 ft. (30,000-60,000 DWT)	8	10	11	12	13	16	19	21
38.00-39.99 ft. (35,000-80,000 DWT)	2	2	3	3	3	4	5	6
>40.00 ft. (over 40,000 DWT)	0	0	0	0	1	1	1	2
TOTAL	57	64	69	72	76	84	92	101

TABLE F-37

FORECAST OF CANAVERAL SCRAP METAL FLEET
WITHOUT PROJECT
BY YEAR AND MAXIMUM DRAFT
1993 - 2043

MAXIMUM DRAFT	1993	1998	2003	2008	2013	2023	2033	2043
<31.99 ft. (under 25,000 DWT)	0	0	0	0	0	0	0	0
32.00-33.99 ft. (20,000-30,000 DWT)	2	2	2	2	2	2	2	2
34.00-35.99 ft. (20,000-50,000 DWT)	2	3	3	3	3	3	3	3
36.00-37.99 ft. (30,000-60,000 DWT)	2	3	3	3	3	3	3	3
38.00-39.99 ft. (35,000-80,000 DWT)	1	1	1	1	1	1	1	1
>40.00 ft. (over 40,000 DWT)	0	0	1	1	1	1	1	1
TOTAL	7	9	10	10	10	10	10	10

The projected fleets reflect a slight increase in maximum draft for the average vessel. Vessels with maximum drafts less than 34 feet comprise approximately one-half of the 1993 fleet, but only about two-fifths of the 2043 fleet expected to call at Port Canaveral. Much of this change is reflected in vessels with maximum drafts greater than 36 feet. Those vessels show a significant relative increase over the study horizon, growing from about one-fifth of the fleet in 1993 to nearly one-third in 2043. This relative increase in the proportion of larger and deeper vessels in the Canaveral Harbor fleet is quite consistent with the expectation that the future world fleet will be include an increasing number of new, bigger and more efficient vessels clustering around HandyMax and PanaMax sizes. Overall, the increase in vessel calls and fleet mix appears reasonable based on trends in the maritime industry and at Canaveral, and is consistent with industry views solicited during the course of this study.

With Project Fleets - Building Cement

The with project building cement fleet reflects greater loaded drafts for the larger vessels. Interviews with spokesmen for the firms which import building cement indicated that they would like to be able to increase the size of shipments to Canaveral, but are unable to do so because of the existing channel depth. The larger vessels now used for importing cement arrive at Canaveral light loaded. With a deeper channel, shipment sizes would increase and fewer trips would be required to transport a given quantity of cement.

Not all vessels used to import cement travel directly to Canaveral. A number of the larger vessels call first at Port Everglades and discharge part of their cement, in order to lighten the vessels sufficiently to permit entrance into the draft-constrained Canaveral Harbor. With channel deepening at Canaveral, this practice would be reduced, leading to fewer vessel calls at Canaveral to transport a given quantity of cement.

The two factors described above account for the reduction in vessel calls at Canaveral with a deeper channel. The larger vessels would transport larger shipments than are possible under without project conditions. The vessels would unload all of their cargoes at Canaveral harbor, no longer unloading part of the cargo at Port Everglades. Both of those factors would cause average shipment size to increase, resulting in fewer vessel calls required to move the projected annual tonnage. The projected with project fleet for a 37-foot channel depth is shown in table F-38 and for 39 or 40-foot channel depth the fleet is shown in table F-39.

TABLE F-38

FORECAST OF CANAVERAL BUILDING CEMENT FLEET
WITH PROJECT - 37-FOOT CHANNEL
BY YEAR AND MAXIMUM DRAFT
1993 - 2043

MAXIMUM DRAFT	1993	2003	2013	2023	2033	2043
<23.99 ft. (under 10,000 DWT)	2	2	2	2	2	2
24.00-25.99 ft. (5,000-12,500 DWT)	0	0	0	0	0	0
26.00-27.99 ft. (7,500-15,000 DWT)	1	1	1	1	1	1
28.00-29.99 ft. (10,000-20,000 DWT)	2	2	2	2	2	2
30.00-31.99 ft. (10,000-30,000 DWT)	6	6	6	7	7	8
32.00-33.99 ft. (20,000-30,000 DWT)	18	21	23	24	26	27
34.00-35.99 ft. (20,000-50,000 DWT)	14	19	21	23	25	28
36.00-37.99 ft. (30,000-60,000 DWT)	6	8	9	12	14	16
38.00-39.99 ft. (35,000-80,000 DWT)	2	3	3	4	5	6
>40.00 ft. (over 40,000 DWT)	0	0	1	1	1	2
TOTAL	51	62	68	75	83	92

TABLE F-39

FORECAST OF CANAVERAL BUILDING CEMENT FLEET WITH PROJECT - 39- & 41-FOOT CHANNEL BY YEAR AND MAXIMUM DRAFT 1993 - 2043

MAXIMUM DRAFT	1993	2003	2013	2023	2033	2043
<23.99 ft. (under 10,000 DWT)	2	2	2	2	2	2
24.00-25.99 ft. (5,000-12,500 DWT)	0	0	0	0	0	0
26.00-27.99 ft. (7,500-15,000 DWT)	1	1	1	1	1	1
28.00-29.99 ft. (10,000-20,000 DWT)	2	2	2	2	2	2
30.00-31.99 ft. (10,000-30,000 DWT)	6	6	6	7	7	8
32.00-33.99 ft. (20,000-30,000 DWT)	18	21	23	24	26	27
34.00-35.99 ft. (20,000-50,000 DWT)	14	19	21	23	25	28
36.00-37.99 ft. (30,000-60,000 DWT)	6	8	9	11	14	16
38.00-39.99 ft. (35,000-80,000 DWT)	1	2	2	3	4	4
>40.00 ft. (over 40,000 DWT)	0	0	1	1	1	1
TOTAL	50	61	67	74	81	89

With Project Fleets - Scrap Metal

The with project scrap metal fleet reflects greater loaded drafts for the larger vessels. Interviews with a spokesman for the firm which exports scrap metal indicated that they would like to be able to increase the size of shipments from Canaveral, but are unable to do so because of the existing channel depth. The larger vessels now used for exporting scrap leave Canaveral light loaded. With a deeper channel, shipment sizes would increase and fewer trips would be required to transport a given quantity of scrap metal. The projected with project fleet for a 37-foot channel depth is shown in table F-38 and for 39 or 41-foot channel depth the fleet is shown in table F-40.

TABLE F-40

FORECAST OF CANAVERAL SCRAP METAL FLEET
WITH PROJECT - 37-FOOT CHANNEL
BY YEAR AND MAXIMUM DRAFT
1993 - 2043

MAXIMUM DRAFT	1993	2003	2013	2023	2033	2043
32.00-33.99 ft. (20,000-30,000 DWT)	2	1	1	1	1	1
34.00-35.99 ft. (20,000-50,000 DWT)	2	3	3	3	3	3
36.00-37.99 ft. (30,000-60,000 DWT)	2	3	3	3	3	3
38.00-39.99 ft. (35,000-80,000 DWT)	1	1	1	1	1	1
>40.00 ft. (over 40,000 DWT)	0	1	1	1	1	1
TOTAL	7	8	8	8	8	8

note: Columns may not total exactly due to rounding.

TABLE F-41

FORECAST OF CANAVERAL SCRAP METAL FLEET WITH PROJECT - 39- & 41-FOOT CHANNEL BY YEAR AND MAXIMUM DRAFT
1993 - 2043

MAXIMUM DRAFT	1993	2003	2013	2023	2033	2043
32.00-33.99 ft. (20,000-30,000 DWT)	1	0	0	0	0	0
34.00-35.99 ft. (20,000-50,000 DWT)	2	3	3	3	3	3
36.00-37.99 ft. (30,000-60,000 DWT)	2	3	3	3	3	3
38.00-39.99 ft. (35,000-80,000 DWT)	1	1	1	1	1	1
>40.00 ft. (over 40,000 DWT)	0	1	1	1	1	1
TOTAL	5	7	7	7	7	7

note: Columns may not total exactly due to rounding.

BENEFITS

The benefits attributable to proposed harbor modifications were evaluated by separable increments. The first project increment was deepening the channel by two feet, the second was deepening by four feet, and finally deepening by six feet was considered. All of the benefits to channel deepening result from increases in shipment sizes and corresponding vessel drafts with a deeper channel.

METHODOLOGY

Draft Restriction.

The maximum draft of vessels calling at Canaveral Harbor under the without project condition was determined through discussion with the pilots and examination of historical records. The pilots stated that the maximum draft for vessels calling at Canaveral is 34.5 feet under ideal conditions and using maximum tidal advantage, and 33.5 feet otherwise. An examination of historical records maintained by both the pilots and the Corps of Engineers (Waterborne Commerce of the United States) showed an extremely small number of trips at drafts greater than 33 feet (only 27 out of more than a thousand trips in 1988). For this reason, the maximum draft under without project conditions was established as 33 feet (recognizing that occasional trips at greater drafts will occur under favorable conditions of weather and tide).

Vessel loading patterns.

Loading patterns, origins and destinations were determined for each of the four major commodities. Data from sources including pilots records, Waterborne Commerce, and interviews with shippers were used in that determination. Details of specific loading patterns by commodity are presented in subsequent sections. Without project loading patterns were used (along with tonnage and fleet projections) to estimate without project transportation costs and with project patterns were used similarly to estimate with project transportation costs.

Voyage Costs.

Voyage costs were calculated for the relevant origins and destinations for each of the major commodity groups. Voyage costs and loading patterns (i.e. shipment size) were taken into account in the calculation of transportation costs per ton, for both without and with project conditions. Vessel operating costs included in Economic Guidance Memorandum #90-3: Fiscal Year 1990, Deep Draft Vessel Cost Estimates were used to calculate voyage costs.

GASOLINE

The first step in calculating benefits for gasoline was to determine the without project loading pattern. This was accomplished by analyzing the 1988 loading pattern shown in Table F-42. Information on trips by vessel size class is shown in the table. Tonnage per trip was calculated based on the maximum cargo tonnage for each vessel, in-bound and out-bound draft, and the appropriate immersion factor.

TABLE F-42

1988 (WITHOUT PROJECT) LOADING PATTERN
GASOLINE BY VESSEL

VESSEL SIZE	NUMBER OF VESSELS	DIN	DOUT	Cargo Tons
31,000	17	26	22	16,668
		26	24	16,668
		32	21	24,156
		26	22	16,044
		26	22	16,418
		26	23	16,668
		27	22	17,542
		27	22	17,666
		27	21	17,916
		27	22	17,916
		27	22	18,290
		31	22	22,984
		32	29	3,120
		32	26	7,862
		33	25	9,360
		33	21	25,404
				289,387
		Avg. tons:		17,023
34,000	2	23	22	1,368
		31	21	21,024
				22,392
		Avg. tons:		11,196
40,000	3	33	25	27,144
		28	24	19,174
		27	26	1,476
				47,794
		Avg. tons:		15,931
TOTAL				359,573

The second step in calculating gasoline benefits was to determine the without project and with project voyage costs. The without project costs were based on a voyage from New Orleans or Aruba to Port Everglades with the vessels fully loaded, discharge of a portion of the load at Port Everglades (an average based on the vessel capacity and average Canaveral tonnage for each vessel, estimated at 10,900 tons for a 31,000 dwt vessel, 19,400 tons for a 34,000 dwt vessel and 17,100 tons for a 40,000 dwt vessel) and discharge of the remaining cargo tonnage at Canaveral.

The with project voyage costs for the 31,000 dwt vessels were based on elimination of the two-port discharge with a 37-foot channel, since that depth would allow those vessels to call at Canaveral fully loaded. The voyage cost calculations for the 34,000 and 40,000 dwt vessels indicated that a 37-foot channel depth would not provide a transportation cost saving over the existing two-port routing for those vessels (the cost per ton associated with a trip directly to Canaveral loaded to a draft of 35 feet was greater for those vessels than the cost for a fully loaded two-port routing). A 39-foot channel depth would allow those vessels to proceed directly to Canaveral loaded to a draft of 37 feet which would provide transportation cost savings over the two-port routing (the cost per ton associated with a trip directly to Canaveral loaded to a draft of 37 feet was less for those vessels than for a fully loaded two-port routing). The voyage costs for a 31,000 dwt vessel from New Orleans to Canaveral under without and with project conditions are shown in table F-43. The costs for a voyage directly to Canaveral loaded to 33 feet were also evaluated for comparison. Those costs indicate that the two-port routing results in a lower cost per ton than the direct route under without project conditions.

TABLE F-43

VOYAGE COST CALCULATIONS
31,000 DWT VESSEL - WITHOUT AND WITH PROJECT
NEW ORLEANS TO CANAVERAL

LIQUID BULK VESSELS	Channel Depth (feet)			
	35 (2-port)	37	39	41
Vessel Sizes				
DWT (long tons)	31,000	31,000	31,000	31,000
DWT (short tons)	34,720	34,720	34,720	34,720
GRT	17,714	17,714	17,714	17,714
Speed (knots)	15	15	15	15
Max. Draft (feet)	35	35	35	35
Light Load (Short tons)	0	0	0	0
Trip Draft (feet)	35	35	35	35
Ship Cost in Port 1 (to Port Everglades)				
Docking Time (hrs)	1	N/A	N/A	N/A
Loading Time (hrs)	18.60	N/A	N/A	N/A
Unloading Time (hrs)	1.67	N/A	N/A	N/A
Delay at Docks (hrs)	1	N/A	N/A	N/A
Total Time (hrs)	22.27	N/A	N/A	N/A
Cost in Port ($/hr)	1313	N/A	N/A	N/A
Subtotal	$29,200	N/A	N/A	N/A
Dockage ($0.11/GRT)	1,950	N/A	N/A	N/A
Wharfage ($1.30/ST)	3,250	N/A	N/A	N/A
Pilots ($10/ft. draft)	350	N/A	N/A	N/A
($0.02/GRT)	350	N/A	N/A	N/A
Tugs (2 @ $775 ea.)	1,550	N/A	N/A	N/A
Total Cost in Port ($)	$36,650	N/A	N/A	N/A

TABLE F-43 (continued)

VOYAGE COST CALCULATIONS
31,000 DWT VESSEL - WITHOUT AND WITH PROJECT
NEW ORLEANS TO CANAVERAL

Ship Cost in Port 2 (to Canaveral)				
Docking Time (hrs)	1	1	1	1
Loading Time (hrs)	0	18.60	18.60	18.60
Unloading Time (hrs)	16.93	18.60	18.60	18.60
Delay at Docks (hrs)	1	1	1	1
Total Time (hrs)	18.93	39.20	39.20	39.20
Cost in Port ($/hr)	1313	1313	1313	1313
Subtotal	$24,900	$51,450	$51,450	$51,450
Dockage ($0.11/GRT)	1,950	1,950	1,950	1,950
Wharfage ($1.30/ST)	33,000	36,300	36,300	36,300
Pilots ($10/ft. draft)	330	350	350	350
($0.02/GRT)	350	350	350	350
Tugs (2 @ $775 ea.)	1,550	1,550	1,550	1,550
Total Cost in Port ($)	$62,100	$91,950	$91,950	$91,950
Ship Cost at Sea				
Distance (naut. mi.)	1648	1598	1598	1598
Time at Sea (hrs)	109.87	106.53	106.53	106.53
Avg. Tidal Delay (hrs)	0	0	0	0
Total Time at Sea (hrs)	109.87	106.53	106.53	106.53
Cost at Sea ($/hr)	1449	1449	1449	1449
Total Cost at Sea ($)	$159,200	$154,350	$154,350	$154,350
Cost of Entire Trip				
Total Trip Cost ($)	$257,900	$246,300	$246,300	$246,300
Cargo Tons (short)	27,900	27,900	27,900	27,900
Unit Cost ($/ton)	9.24	8.83	8.83	8.83
Cost Savings ($/ton)				
Incremental	N/A	.42	0	0
Total	N/A	.42	.42	.42

TABLE F-44

VOYAGE COST CALCULATIONS
31,000 DWT VESSEL - WITHOUT AND WITH PROJECT
ARUBA TO CANAVERAL

Navigation - Unit Cost Calculation

LIQUID BULK VESSELS	Channel Depth (feet)			
	35 (2-port)	37	39	41
Vessel Sizes				
DWT (long tons)	31,000	31,000	31,000	31,000
DWT (short tons)	34,720	34,720	34,720	34,720
GRT	17,714	17,714	17,714	17,714
Speed (knots)	15	15	15	15
Max. Draft (feet)	35	35	35	35
Light Load (Short tons)	0	0	0	0
Trip Draft (feet)	35	35	35	35
Ship Cost in Port 1 (to Port Everglades)				
Docking Time (hrs)	1	N/A	N/A	N/A
Loading Time (hrs)	18 60	N/A	N/A	N/A
Unloading Time (hrs)	1.67	N/A	N/A	N/A
Delay at Docks (hrs)	1	N/A	N/A	N/A
Total Time (hrs)	22.27	N/A	N/A	N/A
Cost in Port ($/hr)	1313	N/A	N/A	N/A
Subtotal	$29,200	N/A	N/A	N/A
Dockage ($0.11/GRT)	1,950	N/A	N/A	N/A
Wharfage ($1.30/ST)	3,250	N/A	N/A	N/A
Pilots ($10/ft. draft)	350	N/A	N/A	N/A
($0.02/GRT)	350	N/A	N/A	N/A
Tugs (2 @ $775 ea.)	1,550	N/A	N/A	N/A
Total Cost in Port ($)	$36,650	N/A	N/A	N/A
Ship Cost in Port 2 (to Canaveral)				
Docking Time (hrs)	1	1	1	1
Loading Time (hrs)	0	18.60	18.60	18.60
Unloading Time (hrs)	16.93	18.60	18.60	18.60
Delay at Docks (hrs)	1	1	1	1
Total Time (hrs)	18.93	39.20	39.20	39.20
Cost in Port ($/hr)	1313	1313	1313	1313
Subtotal	$24,900	$51,500	$51,500	$51,500
Dockage ($0.11/GRT)	1,950	1,950	1,950	1,950
Wharfage ($1.30/ST)	33,000	36,270	36,300	36,300
Pilots ($10/ft. draft)	330	350	350	350
($0 02/GRT)	350	350	350	350
Tugs (2 @ $775 ea.)	1,550	1,550	1,550	1,550
Total Cost in Port ($)	$62,100	$92,000	$92,000	$92,000

TABLE F-44 (continued)

VOYAGE COST CALCULATIONS
31,000 DWT VESSEL - WITHOUT AND WITH PROJECT
ARUBA TO CANAVERAL

Ship Cost at Sea				
Distance (naut. mi.)	2144	2094	2094	2094
Time at Sea (hrs)	142.93	139.60	139.60	139.60
Avg. Tidal Delay (hrs)	0	0	0	0
Total Time at Sea (hrs)	142.93	139.60	139.60	139.60
Cost at Sea ($/hr)	1449.00	1449.00	1449.00	1449.00
Total Cost at Sea ($)	$207,100	$202,300	$202,300	$202,300
Cost of Entire Trip				
Total Trip Cost ($)	$305,800	$294,300	$294,300	$294,300
Cargo Tons (short)	27,900	27,900	27,900	27,900
Unit Cost ($/ton)	10.96	10.55	10.55	10.55
Cost Savings ($/ton)				
Incremental	N/A	.42	0	0
Total	N/A	.42	.42	.42

The voyage costs tables also include unit costs, costs per ton based on the voyage cost divided by cargo tonnage. The difference in unit costs for different channel depths are the savings per ton associated with those depths. The unit costs were used to calculate total transportation costs for the projected gasoline tonnage both without and with project. For example, the percent of tonnage carried by the 31,000 dwt vessel class (80%) was applied to the 1993 projected tonnage and multiplied by the weighted average of the without project unit costs for Aruba and New Orleans ((.33*$8.43)+(.67*$10.96)) to derive the 1993 without project transportation cost for those vessels, estimated at $3,346,200. Similar calculations were performed for each vessel class and summed by 10-year increments for the 50-year period of analysis for without and with project conditions. The results of those calculations, the transportation costs for the Canaveral Harbor gasoline tonnage without and with project, are shown in table F-45A.

TABLE F-45A

GASOLINE - TRANSPORTATION COSTS
CANAVERAL HARBOR TONNAGE
WITHOUT PROJECT, 37′, 39′, AND 41′ DEPTHS
(thousands of dollars)

Without Project Channel

	1993	2003	2013	2023	2033	2043
31,000 dwt	3,346.2	5,437.5	6,943.3	6,943.3	6,943.3	6,943.3
34,000 dwt	248.5	403.8	515.6	515.6	515.6	515.6
40,000 dwt	501.5	814.8	1,040.5	1,040.5	1,040.5	1,040.5
Total	4,096.1	6,656.1	8,499.4	8,499.4	8,499.4	8,499.4

37-Foot Channel

	1993	2003	2013	2023	2033	2043
31,000 dwt	3,212.4	5,220.2	6,665.8	6,665.8	6,665.8	6,665.8
34,000 dwt	248.5	403.8	515.6	515.6	515.6	515.6
40,000 dwt	501.5	814.8	1,040.5	1,040.5	1,040.5	1,040.5
Total	3,962.4	6,438.9	8,221.9	8,221.9	8,221.9	8,221.9

39-Foot Channel

	1993	2003	2013	2023	2033	2043
31,000 dwt	3,212.4	5,220.2	6,665.8	6,665.8	6,665.8	6,665.8
34,000 dwt	246.2	400.1	510.9	510.9	510.9	510.9
40,000 dwt	496.5	806.9	1,030.3	1,030.3	1,030.3	1,030.3
Total	3,955.2	6,427.2	8,207.1	8,207.1	8,207.1	8,207.1

41-Foot Channel

	1993	2003	2013	2023	2033	2043
31,000 dwt	3,212.4	5,220.2	6,665.8	6,665.8	6,665.8	6,665.8
34,000 dwt	238.7	387.9	495.3	495.3	495.3	495.3
40,000 dwt	481.5	782.5	999.2	999.2	999.2	999.2
Total	3,932.7	6,390.6	8,160.3	8,160.3	8,160.3	8,160.3

In addition to the benefits to the Canaveral gasoline tonnage, deepening the channel at Canaveral would provide benefits to the tonnage carried aboard the vessels bound for Canaveral which is discharged at Port Everglades. This tonnage could be carried aboard fully laden vessels which would travel to Port Everglades and return immediately, saving the transportation costs associated with the additional sailing and port time required without the project at Canaveral. For example, the transportation cost per ton for gasoline shipped from New Orleans and discharged from a 31,000 dwt vessel calling at Port Everglades and continuing on to Canaveral is $9.24, the same as for the tonnage discharged at Canaveral, since the cost per ton is defined as total voyage cost divided by total cargo tonnage. If the same tonnage were shipped aboard a fully laden vessel directly to Port Everglades without continuing on to Canaveral, the cost per ton would be reduced to $7.78.

The actual deliveries to Canaveral shown in table F-42 are not the most economical means of delivering gasoline to both Canaveral and Port Everglades. Neither is direct routing. The benefits to gasoline were calculated based on the difference in the least costly transportation cost both without and with project. The methodology used is detailed in the following paragraphs.

The without project transportation costs for the two-port discharge of gasoline tonnage and direct shipments to Port Everglades or Canaveral is illustrated in table 45-B.

TABLE 45-B

COMPARATIVE TRANSPORTATION COSTS/TON
GASOLINE - WITHOUT PROJECT

	31,000 dwt	34,000 dwt	40,000 dwt
NEW ORLEANS TO CANAVERAL			
2-port	9.24	8.90	8.43
Direct	9.40	10.06	9.50
NEW ORLEANS TO PORT EVERGLADES			
2-port	9.24	8.90	8.43
Direct	7.78	7.52	7.14
ARUBA TO CANAVERAL			
2-port	10.96	10.51	9.92
Direct	11.28	12.13	11.43
ARUBA TO PORT EVERGLADES			
2-port	10.96	10.51	9.92
Direct	9.49	9.13	8.63

The unit costs shown above can be applied to the base year tonnage shown in the report to demonstrate the least costly means of transportation without project. In the example below, the total transportation cost of tonnage bound for Port Everglades and for Canaveral is calculated for three different cases. The first case uses the actual loading pattern observed in 1987 for a 31,000 DWT vessel calling first at Port Everglades and continuing on to Canaveral. The tons per trip shown are averages for the 31,000 DWT class of vessels. Case 1 results in a total transportation cost of $1,616,800 for delivery of 106,200 tons of gasoline to Canaveral and 68,700 tons of gasoline to Port Everglades from New Orleans.

WITHOUT PROJECT

GASOLINE FROM NEW ORLEANS - 31,000 DWT VESSEL

Case 1 - Two Port (Actual)	Tons per Trip	1993 Total Tonnage	Cost Per Ton	Total Transport Cost
Canaveral (2-port)	17,000	106,235	9.24	981,611
Port Everglades (2-port)	10,900	68,740	9.24	635,158
	27,900	174,975	9.24	1,616,769

Case 2 shows the cost of direct routing from New Orleans to Port Everglades for the same amount of tonnage as case 1. As noted in the comment, direct routing results in a lower weighted average cost per ton ($8.76 vs. $9.24) than the two-port routing shown in case 1 above. The total transportation cost for case 2 is $1,533,400.

WITHOUT PROJECT

GASOLINE FROM NEW ORLEANS - 31,000 DWT VESSEL

Case 2 - Direct Shipment	Tons per Trip	1993 Total Tonnage	Cost Per Ton	Total Transport Cost
Canaveral	27,900	106,235	9.40	998,609
Port Everglades	27,900	68,740	7.78	534,797
		174,975	8.76	1,533,406

Case 3 shows the least costly means of delivering gasoline to both Canaveral and Port Everglades. Case 3 is based on two-port routing, with the minimum amount offloaded at Port Everglades to lighten the vessel to 33 feet (the maximum draft at Canaveral without project). In this case, 10,500 tons would be offloaded at Port Everglades from vessels bound for Canaveral and 58,300 tons would be shipped directly to Port Everglades. The total transportation cost for case 3 's $1,531,700.

WITHOUT PROJECT

GASOLINE FROM NEW ORLEANS - 31,000 DWT VESSEL

Case 3 - Two Port (Least cost)	Tons per Trip	Total Tonnage	Cost Per Ton	Total Transport Cost
Canaveral (2-port)	25,400	106,235	9.24	981,611
Port Everglades (2-port)	2,500	10,456	9.24	96,613
Subtotal	27,900	116,691		1,078,224
Port Everglades (direct)	27,900	58,284	7.78	453,450
		174,975	8.75	1,531,674

Case 3 was the basis for calculation of without project transportation costs shown in the report. The without project transportation costs for 1993 Canaveral gasoline tonnage for the 31,000 DWT vessel class shown in Table F-45A ($3,346,200) include $981,600 for New Orleans tonnage and $2,364,600 for Aruba tonnage ($981,600 + $2,364,600 = $3,346,200).

The minimum amount of tonnage which would have to be discharged at Port Everglades to lighten each size of vessel to 33 feet (the maximum draft at Canaveral under without project conditions) was calculated and multiplied by the number of trips by each size vessel without a project to determine the tonnage affected by these potential savings. The Port Everglades tonnage estimated by this method was then multiplied by the appropriate transportation costs per ton for without project and improved conditions at Canaveral. For example, the without project transportation costs for 1993 Port Everglades gasoline tonnage for the 31,000 DWT vessel class shown in Table F-45B ($328,800) include $96,600 for New Orleans tonnage and $232,200 for Aruba tonnage ($96,600 + $232,200 = $328,800). Without and with project transportation costs for the Port Everglades tonnage affected by improvements to Canaveral Harbor are shown in table F-45C.

TABLE F-45C

GASOLINE - TRANSPORTATION COSTS
PORT EVERGLADES TONNAGE
WITHOUT PROJECT, 37', 39', AND 41' DEPTHS
(thousands of dollars)

Without Project Channel

	1993	2003	2013	2023	2033	2043
31,000 dwt	328.8	534.3	682.3	682.3	682.3	682.3
34,000 dwt	71.5	116.2	148.4	148.4	148.4	148.4
40,000 dwt	201.8	328.0	418.8	418.8	418.8	418.8
TOTAL	602.2	978.6	1,249.6	1,249.6	1,249.6	1,249.6

37-Foot Channel

	1993	2003	2013	2023	2033	2043
31,000 dwt	282.4	458.9	585.9	585.9	585.9	585.9
34,000 dwt	71.5	116.2	148.4	148.4	148.4	148.4
40,000 dwt	201.8	328.0	418.8	418.8	418.8	418.8
TOTAL	555.8	903.1	1,153.2	1,153.2	1,153.2	1,153.2

39-Foot Channel

	1993	2003	2013	2023	2033	2043
31,000 dwt	282.4	458.9	585.9	585.9	585.9	585.9
34,000 dwt	61.6	100.2	127.9	127.9	127.9	127.9
40,000 dwt	174.2	283.1	361.5	361.5	361.5	361.5
TOTAL	518.3	842.2	1,075.4	1,075.4	1,075.4	1,075.4

TABLE F-45C (continued)

GASOLINE - TRANSPORTATION COSTS
PORT EVERGLADES TONNAGE
WITHOUT PROJECT, 37', 39', AND 41' DEPTHS
(thousands of dollars)

41-Foot Channel

	1993	2003	2013	2023	2033	2043
31,000 dwt	282.4	458.9	585.9	585.9	585.9	585.9
34,000 dwt	61.6	100.2	127.9	127.9	127.9	127.9
40,000 dwt	174.2	283.1	361.5	361.5	361.5	361.5
TOTAL	518.3	842.2	1,075.4	1,075.4	1,075.4	1,075.4

The sum of the transportation costs shown in tables 45A and 45C is displayed in table 45D. That table also includes estimates of average annual transportation cost and average annual benefits, calculated at 8 7/8 percent for a 50-year period of analysis.

TABLE F-45D
GASOLINE TRANSPORTATION COSTS AND SAVINGS
WITHOUT PROJECT, 37', 39' AND 41' DEPTHS

Channel Depth	1993	2003	2013	2023	2033	2043	Total Average Annual	Average Annual Benefits
W/out	4,698.3	7,634.7	9,748.9	9,748.9	9,748.9	9,748.9	7,362.1	N/A
37'	4,518.1	7,342.0	9,375.1	9,375.1	9,375.1	9,375.1	7,079.8	282.3
39'	4,473.5	7,269.4	9,282.4	9,282.4	9,282.4	9,282.4	7,009.8	352.3
41'	4,450.9	7,232.7	9,235.6	9,235.6	9,235.6	9,235.6	6,974.4	387.6

FUEL OIL

The first step in calculating benefits for fuel oil was to determine the without project loading pattern. This was accomplished by analyzing the 1988 loading pattern shown in Table F-46. Information on trips by vessel size class is shown in the table. Tonnage per trip was calculated based on the maximum cargo tonnage for each vessel, in-bound and out-bound draft, and the appropriate immersion factor.

TABLE F-46

1988 (WITHOUT PROJECT) LOADING PATTERN
FUEL OIL BY VESSEL

W/out Loading - 1988

Vessel Size	No. of Vessels	DIN	DOUT	Cargo Tons
29,000 dwt	13	24	22	13,620
		25	22	14,868
		25	23	14,868
		25	23	14,868
		29	26	3,744
		30	29	1,248
		30	23	21,108
		31	21	21,732
		33	30	3,120
		33	30	4,243
		33	26	9,235
		34	30	4,992
		34	30	5,491
				133,138
32,000 dwt	7	28	27	672
		29	27	2,419
		31	26	24,768
		28	24	20,870
		32	24	24,499
		33	23	26,515
		35	23	28,128
				127,872
35,000 dwt	1	33	24	27,990
				27,990
40,000 dwt	2	30	24	25,206
		34	27	31,374
				56,580

TABLE F-46 (continued)

1988 (WITHOUT PROJECT) LOADING PATTERN
FUEL OIL BY VESSEL

W/out Loading - 1988

Vessel Size	No. of Vessels	DIN	DOUT	Cargo Tons
45,000 dwt+	2	34	26	47,844
		26	25	2,076
				49,920
TOTAL TONNAGE				395,500

Trips were characterized as 33-foot draft (the maximum permitted without project) or less than 33-foot. Future without project fleets by size class were categorized in the same fashion. The 1988 actual loaded drafts shown in table F-44 were used as the basis for the categorization. The without project fleet was adjusted to reflect the recent purchase of the Coastal Corpus Christi and the Coastal Eagle Point. Voyage cost calculations revealed that transportation costs per ton associated with those vessels loaded to 33-foot draft (the maximum draft without project) are less than the cost per ton for the Pecos at the same draft. Since the Pecos is the smallest vessel in current use at Canaveral, and Coastal Fuels Marketing has indicated that this chartered vessel is likely to be replaced, both the without project and with project fleets and transportation cost calculations reflect the replacement of the Pecos with the larger (50,000 dwt) new vessels. The resulting without project fleets by loaded draft are shown in table F-47.

TABLE F-47

WITHOUT PROJECT FLEETS BY LOADED DRAFT
FUEL OIL BY VESSEL
1993-2043

	1993	2003	2013	2023	2033	2043
30-33,000 dwt						
33' draft	4	6	6	6	6	6
<33' draft	6	8	8	8	8	8
Total	10	14	14	14	14	14
33-36,000 dwt						
33' draft	1	1	1	1	1	1
<33' draft	0	1	1	1	1	1
Total	1	2	2	2	2	2

TABLE F-47 (continued)

WITHOUT PROJECT FLEETS BY LOADED DRAFT
FUEL OIL BY VESSEL
1993-2043

	1993	2003	2013	2023	2033	2043
36-45,000 dwt						
33′ draft	1	2	2	2	2	2
<33′ draft	2	2	2	2	2	2
Total	3	4	4	4	4	4
45,000+ dwt						
33′ draft	7	9	9	9	9	9
<33′ draft	8	11	11	11	11	11
Total	15	20	20	20	20	20
TOTAL						
33′ draft	13	18	18	18	18	18
<33′ draft	16	22	22	22	22	22
Total	29	40	40	40	40	40

The cargo tonnage for each size class of vessel at 33-foot draft and at less than 33 feet was calculated based on the maximum cargo tonnage for each vessel, in-bound and out-bound draft, and the appropriate immersion factor. The fleet information shown in table F-47 was multiplied by the cargo tonnage for each vessel at each draft to check the reasonableness of the without project loading. The results of those calculations, shown in table F-48, were extremely close to the projected future tonnage. The 1993 projected tonnage is 644,000 tons and the calculated cargo tonnage in table F-48 is 646,000. Similarly, the projected tonnage for 2003-2043 is 875,000 tons and the calculated cargo tonnage is 888,000 tons. Those calculations confirmed that the without project fleet projections are consistent with the tonnage projections.

TABLE F-48

WITHOUT PROJECT CARGO TONS
FUEL OIL BY VESSEL SIZE CLASS
1993-2043

	1993	2003	2013	2023	2033	2043
30-33,000 dwt						
33' draft	104,448	156,672	156,672	156,672	156,672	156,672
<33' draft	94,200	125,600	125,600	125,600	125,600	125,600
Total	198,648	282,272	282,272	282,272	282,272	282,272
33-36,000 dwt						
33' draft	27,288	27,288	27,288	27,288	27,288	27,288
<33' draft	0	15,700	15,700	15,700	15,700	15,700
Total	27,288	42,988	42,988	42,988	42,988	42,988
36-45,000 dwt						
33' draft	29,832	59,664	59,664	59,664	59,664	59,664
<33' draft	31,400	31,400	31,400	31,400	31,400	31,400
Total	61,232	91,064	91,064	91,064	91,064	91,064
45,000+ dwt						
33' draft	233,268	299,916	299,916	299,916	299,916	299,916
<33' draft	125,600	172,700	172,700	172,700	172,700	172,700
Total	358,868	472,616	472,616	472,616	472,616	472,616
TOTAL						
33' draft	394,836	543,540	543,540	543,540	543,540	543,540
<33' draft	251,200	345,400	345,400	345,400	345,400	345,400
Total	646,036	888,840	888,940	888,940	888,940	888,940

The next step in determining the benefits was to calculate the voyage costs of transporting fuel oil from New Orleans or Aruba to Canaveral for each size of vessel loaded to several different drafts. For example, costs were calculated for a 32,000 dwt vessel, typical of the 30,000 to

33,000 dwt size class, loaded to drafts of 33 feet, 25.25 feet, and 35 feet. Those three drafts represent, respectively, the maximum draft allowed without project (33 feet), the average inbound draft for trips at less than 33 feet for that class of vessel (25.25 feet), and the maximum draft allowed with a deeper channel (35 feet). In this example, the maximum draft of the vessel can be accommodated with two feet of channel deepening. For larger vessels, capable of loaded drafts more than two feet deeper than 33 feet, voyage costs were calculated for those greater loaded drafts, up to 39 feet.

Voyage costs were divided by the cargo tonnage for each voyage to determine the unit transportation cost (cost per ton). U.S. flag vessel operating costs were used to calculate the cost of coastwise shipments from New Orleans. Foreign flag vessel operating costs were used to calculate the cost of imports from Aruba. An example of the voyage and unit cost calculations for a 32,000 dwt vessel is shown in table F-49.

TABLE F-49

VOYAGE & UNIT COST CALCULATIONS
32,000 DWT FUEL OIL VESSEL
WITHOUT AND WITH PROJECT

NEW ORLEANS TO CANAVERAL LIQUID BULK VESSELS	Channel Depth (feet)				
	35	35(lite)	37	39	41
Vessel Sizes					
DWT (long tons)	32000	32000	32000	32000	32000
DWT (short tons)	35840	35840	35840	35840	35840
Speed (knots)	15	15	15	15	15
Max. Draft (feet)	35	35	35	35	35
Light Load (Short tons)	2688	13100	0	0	0
Trip Draft (feet)	33	25.25	35	35	35
Ship Cost in Port					
Docking Time (hrs)	1	1	1	1	1
Loading Time (hrs)	17.41	10.47	19.20	19.20	19.20
Unloading Time (hrs)	17.41	10.47	19.20	19.20	19.20
Delay at Docks (hrs)	1	1	1	1	1
Total Time (hrs)	36.82	22.93	40.40	40.40	40.40
Cost in Port ($/hr)	1324	1324	1324	1324	1324
Total Cost in Port ($)	$48,744	$30,364	$53,490	$53,490	$53,490
Ship Cost at Sea					
Distance (naut. mi.)	1,598	1,598	1,598	1,598	1,598
Time at Sea (hrs)	106.53	106.53	106.53	106.53	106.53
Avg. Tidal Delay (hrs)	0	0	0	0	0
Total Time at Sea (hrs)	106.53	106.53	106.53	106.53	106.53
Cost at Sea ($/hr)	1,462	1,462	1,462	1,462	1,462
Total Cost at Sea ($)	$155,709	$155,709	$155,709	$155,709	$155,709
Harbor Fees					
a. Origin ($)	1200	1200	1200	1200	1200
b. Destination ($)	1200	1200	1200	1200	1200

TABLE F-49 (continued)

VOYAGE & UNIT COST CALCULATIONS
32,000 DWT FUEL OIL VESSEL
WITHOUT AND WITH PROJECT

LIQUID BULK VESSELS	Channel Depth (feet) 35	35(lite)	37	39	41
Cost of Entire Trip					
Total Trip Cost ($)	$206,854	$188,473	$211,599	$211,599	$211,599
Cargo Tons (short)	26,112	15,700	28,800	28,800	28,800
Unit Cost ($/ton)	7.92	12.00	7.35	7.35	7.35
Cost Savings ($/ton)					
Incremental	N/A	N/A	.57	0	0
Total	N/A	N/A	.57	.57	.57

The without project unit costs and the without project cargo tons from table F-47 were combined to determine the average annual total transportation cost, without project. The tonnage for each vessel size class and loading condition was multiplied by the appropriate unit cost (two-thirds of the unit cost for a trip originating in New Orleans plus one-third of the unit cost for a trip originating in Aruba, consistent with the split in tonnage from each origin). The resulting transportation cost totals were summed for each 10-year period from 1993 to 2043 and discounted to an average annual value using the current Federal project evaluation interest rate of 8 7/8 percent. The results of those calculations are presented in table F-50.

TABLE F-50

WITHOUT PROJECT TRANSPORTATION COST
FUEL OIL FLEETS BY DRAFT
1993-2043

	1993	2003	2013	2023	2033	2043
30-33,000						
33' draft	716,215	1,074,322	1,074,322	1,074,322	1,074,322	1,074,322
>33' draft	984,681	1,312,908	1,312,908	1,312,908	1,312,908	1,312,908
Total	1,700,896	2,387,230	2,387,230	2,387,230	2,387,230	2,387,230
33-36,000						
33' draft	185,371	185,371	185,371	185,371	185,371	185,371
>33' draft	0	168,335	168,335	168,335	168,335	168,335
Total	185,371	353,706	353,706	353,706	353,706	353,[illegible]

TABLE F-50 (continued)

WITHOUT PROJECT TRANSPORTATION COST
FUEL OIL FLEETS BY DRAFT
1993-2043

	1993	2003	2013	2023	2033	2043
36-45,000						
33' draft	195,917	391,835	391,835	391,835	391,835	391,835
>33' draft	348,849	348,849	348,849	348,849	348,849	348,849
Total	544,766	740,684	740,684	740,684	740,684	740,684
45,000+						
33' draft	1,505,948	1,936,219	1,936,219	1,936,219	1,936,219	1,936,219
>33' draft	1,492,393	2,052,040	2,052,040	2,052,040	2,052,040	2,052,040
Total	2,998,341	3,988,259	3,988,259	3,988,259	3,988,259	3,988,259
TOTAL						
33' draft	2,603,451	3,587,747	3,587,747	3,587,747	3,587,747	3,587,747
>33' draft	2,825,923	3,882,133	3,882,133	3,882,133	3,882,133	3,882,133
Total	5,429,374	7,469,879	7,469,879	7,469,879	7,469,879	7,469,879

AVERAGE ANNUAL COST: 6,854,231

Just as the without project transportation costs were calculated based on without project fleets, loading patterns and unit costs, with project transportation costs were calculated based on with project fleets, loading patterns and unit costs. With project loading patterns reflect deeper loaded drafts for the larger vessels, in response to increased channel depths; however, a substantial number of trips at less than 33 feet are also included in accordance with statements by one of the fuel oil-receiving firms that they would not increase shipment sizes if the channel were deepened. An example of the with project fleets by loaded draft for a 37-foot deep channel is shown in table F-51. That table provides information about the fleet with a 37-foot channel corresponding to the information shown in table F-47 for the without project channel. Similarly, table F-52 provides information about cargo tons by vessel class and loaded draft corresponding to the information shown in table F-48.

TABLE F-51

WITH PROJECT FLEETS BY LOADED DRAFT
37-FOOT CHANNEL DEPTH
FUEL OIL BY VESSEL
1993-2043

	1993	2003	2013	2023	2033	2043
30-33,000 dwt						
35' draft	4	6	6	6	6	6
<35' draft	5	6	6	6	6	6
Total	9	12	12	12	12	12
33-36,000 dwt						
35' draft	1	1	1	1	1	1
<35' draft	0	1	1	1	1	1
Total	1	2	2	2	2	2
36-45,000 dwt						
35' draft	1	2	2	2	2	2
<35' draft	2	2	2	2	2	2
Total	3	4	4	4	4	4
45,000+ dwt						
35' draft	6	8	8	8	8	8
<35' draft	6	8	8	8	8	8
Total	12	16	16	16	16	16
TOTAL						
35' draft	12	17	17	17	17	17
<35' draft	13	17	17	17	17	17
Total	25	34	34	34	34	34

TABLE F-52

WITH PROJECT CARGO TONS
37-FOOT CHANNEL DEPTH
FUEL OIL BY VESSEL SIZE CLASS
1993-2043

	1993	2003	2013	2023	2033	2043
30-33,000 dwt						
35' draft	115,200	172,800	172,800	172,800	172,800	172,800
<35' draft	78,500	94,200	94,200	94,200	94,200	94,200
Total	193,700	267,000	267,000	267,000	267,000	267,000
33-36,000 dwt						
35' draft	30,096	30,096	30,096	30,096	30,096	30,096
<35' draft	0	15,700	15,700	15,700	15,700	15,700
Total	30,096	45,796	45,796	45,796	45,796	45,796
36-45,000 dwt						
35' draft	32,916	65,832	65,832	65,832	65,832	65,832
<35' draft	31,400	31,400	31,400	31,400	31,400	31,400
Total	64,316	97,232	97,232	97,232	97,232	97,232
45,000+ dwt						
35' draft	219,960	293,280	293,280	293,280	293,280	293,280
<35' draft	132,000	176,000	176,000	176,000	176,000	176,000
Total	351,960	469,280	469,280	469,280	469,280	469,280
TOTAL						
35' draft	398,172	562,008	562,008	562,008	562,008	562,008
>35' draft	241,900	317,300	317,300	317,300	317,300	317,300
Total	640,072	879,308	879,308	879,308	879,308	879,308

As for the without project cost calculations, the appropriate unit costs and the cargo tons from table F-52 were combined to determine the average annual total transportation cost, with a 37-foot channel depth. The tonnage for each vessel size class and loading condition was multiplied by the appropriate unit cost. The resulting transportation cost totals were summed for each 10-year period from 1993 to 2043 and discounted to an average annual value using the current Federal project evaluation interest rate of 8 7/8 percent. The average annual transportation cost with a 37-foot channel was subtracted from the average annual transportation cost without project to provide an estimate of average annual benefits to fuel oil. The results of those calculations for a 37-foot channel are presented in table F-53. Similar calculations were performed for channel depth of 39 and 41 feet. The results of those calculations, along with those for the without project and 37-foot depth are displayed in table F-54.

TABLE F-53

WITH 37-FOOT CHANNEL TRANSPORTATION COST
FUEL OIL FLEETS BY DRAFT
1993-2043

	1993	2003	2013	2023	2033	2043
30-33,000						
33' draft	731,643	1,097,464	1,097,464	1,097,464	1,097,464	1,097,464
>33' draft	820,568	984,681	984,681	984,681	984,681	984,681
Total	1,552,210	2,082,145	2,082,145	2,082,145	2,082,145	2,082,145
33-36,000						
33' draft	189,499	189,499	189,499	189,499	189,499	189,499
>33' draft	0	168,335	168,335	168,335	168,335	168,335
Total	189,499	357,834	357,834	357,834	357,834	357,834
36-45,000						
33' draft	200,608	401,216	401,216	401,216	401,216	401,216
>33' draft	348,849	348,849	348,849	348,849	348,849	348,849
Total	549,457	750,064	750,064	750,064	750,064	750,064
45,000+						
33' draft	1,323,279	1,764,372	1,764,372	1,764,372	1,764,372	1,764,372
>33' draft	1,568,438	2,091,251	2,091,251	2,091,251	2,091,251	2,091,251
Total	2,891,717	3,855,623	3,855,623	3,855,623	3,855,623	3,855,623

TABLE F-53 (continued)

WITH 37-FOOT CHANNEL TRANSPORTATION COST
FUEL OIL FLEETS BY DRAFT
1993-2043

	1993	2003	2013	2023	2033	2043
TOTAL						
33' draft	2,445,028	3,452,550	3,452,550	3,452,550	3,452,550	3,452,550
>33' draft	2,737,855	3,593,116	3,593,116	3,593,116	3,593,116	3,593,116
Total	5,182 883	7,045,667	7,045,667	7,045,667	7,045,667	7,045,667

AVERAGE ANNUAL COST: 6,483,639

AVERAGE ANNUAL SAVINGS: 370,591

TABLE F-54

FUEL OIL TRANSPORTATION COSTS AND SAVINGS
WITHOUT PROJECT, 37', 39' AND 41' DEPTHS
1993-2043

(thousands of dollars)

	1993	2003	2013	2023	2033	2043	Total Average Annual	Average Annual Savings
W/OUT	5,429.4	7,469.9	7,469.9	7,469.9	7,469.9	7,469.9	6,854.2	N/A
37'	5,182.9	7,045.7	7,045.7	7,045.7	7,045.7	7,045.7	6,483.6	370.6
39'	5,058.0	6,753.4	6,753.4	6,753.4	6,753.4	6,753.4	6,241.9	612.4
41'	4,907.5	6,613.8	6,613.8	6,613.8	6,613.8	6,613.8	6,099.0	755.3

BUILDING CEMENT

Building cement benefits were calculated by a method similar to that used for gasoline and fuel oil benefits. Without project loading patterns were determined based on the 1988 fleet and tonnage. Unit costs were calculated for the several size classes of vessels which would benefit from a deeper channel from each of three origins (Colombia, Venezuela and the Mediterranean). Transportation costs were not calculated for voyages from Mexico, since the loading ports there are draft constrained. Without project voyage costs were calculated for both a direct trip to Canaveral and a two-port trip with part of the cargo unloaded at Port Everglades. An example of the voyage cost calculations is shown in table F-55.

TABLE F-55

VOYAGE & UNIT COST CALCULATIONS
28,000 DWT DRY BULK VESSEL
WITHOUT AND WITH PROJECT

COLOMBIA TO CANAVERAL

Navigation - Unit Cost Calculation

DRY BULK VESSELS	Channel Depth (feet)				
	35 Direct	35 2-port	37	39	41
Vessel Sizes					
DWT (long tons)	28,000	28,000	28,000	28,000	28,000
DWT (short tons)	31,360	31,360	31,360	31,360	31,360
GRT	16,000	16,000	16,000	16,000	16,000
Speed (knots)	15	15	15	15	15
Max. Draft (feet)	35	35	35	35	35
Light Load (Short tons)	2,280	0	0	0	0
Trip Draft (feet)	33	35	35	35	35
Ship Cost in Port 1 (to Port Everglades)					
Docking Time (hrs)	N/A	1	N/A	N/A	N/A
Loading Time (hrs)	N/A	16.80	N/A	N/A	N/A
Unloading Time (hrs)	N/A	5.32	N/A	N/A	N/A
Delay at Docks (hrs)	N/A	1	N/A	N/A	N/A
Total Time (hrs)	N/A	24.12	N/A	N/A	N/A
Cost in Port ($/hr)	N/A	385	N/A	N/A	N/A
Subtotal	N/A	$9,286	N/A	N/A	N/A
Dockage ($0.11/GRT)	N/A	1,760	N/A	N/A	N/A
Wharfage ($1.30/ST)	N/A	10,374	N/A	N/A	N/A
Pilots ($10/ft. draft)	N/A	350	N/A	N/A	N/A
($0.02/GRT)	N/A	320	N/A	N/A	N/A
Tugs (2 @ $775 ea.)	N/A	1,550	N/A	N/A	N/A
Total Cost in Port ($)	N/A	$23,640	N/A	N/A	N/A

TABLE F-55 (continued)

VOYAGE & UNIT COST CALCULATIONS
28,000 DWT DRY BULK VESSEL
WITHOUT AND WITH PROJECT

Ship Cost in Port 2 (to Canaveral)					
Docking Time (hrs)	1	1	1	1	1
Loading Time (hrs)	15.28	0	16.80	16.80	16.80
Unloading Time (hrs)	15.28	11.48	16.80	16.80	16.80
Delay at Docks (hrs)	1	1	1	1	1
Total Time (hrs)	32.56	13.48	35.60	35.60	35.60
Cost in Port ($/hr)	377	377	377	377	377
Subtotal	$12,275	$5,082	$13,421	$13,421	$13,421
Dockage ($0.11/GRT)	1,760.00	1,760.00	1,760.00	1,760.00	1,760.00
Wharfage ($1.30/ST)	29,796.00	22,386.00	32,760.00	32,760.00	32,760.00
Pilots ($10/ft. draft)	330.00	280.00	350.00	350.00	350.00
($0.02/GRT)	320.00	320.00	320.00	320.00	320.00
Tugs (2 @ $775 ea.)	1,550.00	1,550.00	1,550.00	1,550.00	1,550.00
Total Cost in Port ($)	$46,031	$31,378	$50,161	$50,161	$50,161
Ship Cost at Sea					
Distance (naut. mi.)	2530	2580	2530	2530	2530
Time at Sea (hrs)	168.67	172	168.67	168.67	168.67
Avg. Tidal Delay (hrs)	0	0	0	0	0
Total Time at Sea (hrs)	168.67	172	168.67	168.67	168.67
Cost at Sea ($/hr)	516.10	516.10	516.10	516.10	516.10
Total Cost at Sea ($)	$87,049	$88,769	$87,049	$87,049	$87,049
Cost of Entire Trip					
Total Trip Cost ($)	$133,340	$143,895	$137,495	$137,495	$137,495
Cargo Tons (short)	22,920	25,200	25,200	25,200	25,200
Unit Cost ($/ton)	5.82	5.71	5.46	5.46	5.46
Cost Savings ($/ton)					
Incremental	N/A	N/A	.29	0	0
Total	N/A	N/A	.29	.29	.29

The without project transportation costs were calculated from the unit costs, average tons per vessel (a weighted average of 1/3 the cargo tonnage for a direct trip and 2/3 the tonnage discharged at Canaveral for a two-port trip), and number of vessels by size class. Those calculations are shown in table F-54.

As a result of analysis of tonnage and fleet information and discussions with harbor users it was determined that approximately one-third of the cement-carrying vessels travel directly from their port of origin to Canaveral, while two-thirds call at Port Everglades before Canaveral. Those factors (1/3 direct trip, 2/3 two-port trip) were used to calculate the weighted average without project unit costs which are displayed in table F-56.

TABLE F-56

WITHOUT PROJECT TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

WITHOUT PROJECT TRANSPORTATION COST

COLOMBIA

1993

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	9	19,272	173,448	5.74	996,005
36.00-37.99 ft. (30,000-60,000 DWT)	5	19,344	92,851	5.65	524,885
38.00-39.99 ft. (35,000-80,000 DWT)	2	26,590	53,179	5.11	271,645
>40.00 ft. (over 40,000 DWT)	0	26,722	0	5.11	0
TOTAL	16		319,478		1,792,535

COLOMBIA

2003

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	10	19,272	192,720	5.74	1,106,672
36.00-37.99 ft. (30,000-60,000 DWT)	7	19,344	135,408	5.65	765,457
38.00-39.99 ft. (35,000-80,000 DWT)	2	26,590	53,179	5.11	271,645
>40.00 ft. (over 40,000 DWT)	0	26,722	0	5.11	0
TOTAL	19		381,307		2,143,774

TABLE F-56 (continued)

WITHOUT PROJECT TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

COLOMBIA

2013

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	10	19,272	192,720	5.74	1,106,672
36.00-37.99 ft. (30,000-60,000 DWT)	8	19,344	154,752	5.65	874,808
38.00-39.99 ft. (35,000-80,000 DWT)	2	26,590	47,861	5.11	244,481
>40.00 ft. (over 40,000 DWT)	1	26,722	26,722	5.11	136,497
TOTAL	21		422,055		2,362,458

2023

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	11	19,272	211,992	5.74	1,217,339
36.00-37.99 ft. (30,000-60,000 DWT)	9	19,344	174,096	5.65	984,159
38.00-39.99 ft. (35,000-80,000 DWT)	2	26,590	53,179	5.11	271,645
>40.00 ft. (over 40,000 DWT)	1	26,722	26,722	5.11	136,497
TOTAL	23		465,989		2,609,640

TABLE F-56 (continued)

WITHOUT PROJECT TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

COLOMBIA 2033

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	11	19,272	211,992	5.74	1,217,339
36.00-37.99 ft. (30,000-60,000 DWT)	10	19,344	193,440	5.65	1,093,510
38.00-39.99 ft. (35,000-80,000 DWT)	3	26,590	79,769	5.11	407,468
>40.00 ft. (over 40,000 DWT)	1	26,722	26,722	5.11	136,497
TOTAL	25		511,922		2,854,814

2043

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	11	19,272	211,992	5.74	1,217,339
36.00-37.99 ft. (30,000-60,000 DWT)	10	19,344	193,440	5.65	1,093,510
38.00-39.99 ft. (35,000-80,000 DWT)	4	26,590	106,358	5.11	543,291
>40.00 ft. (over 40,000 DWT)	2	26,722	53,443	5.11	272,994
TOTAL	27		565,234		3,127,134

TABLE F-56 (continued)

WITHOUT PROJECT TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

VENEZUELA

1993

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	4	19,272	77,088	5.68	438,116
36.00-37.99 ft. (30,000-60,000 DWT)	2	19,344	38,688	5.57	215,351
38.00-39.99 ft. (35,000-80,000 DWT)	1	26,590	26,590	5.06	134,572
>40.00 ft. (over 40,000 DWT)	0	26,722	0	N/A	0
TOTAL	7		142,366		788,039

2003

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	5	19,272	96,360	5.68	547,645
36.00-37.99 ft. (30,000-60,000 DWT)	3	19,344	58,032	5.57	323,026
38.00-39.99 ft. (35,000-80,000 DWT)	1	26,590	26,590	5.06	134,572
>40.00 ft. (over 40,000 DWT)	0	26,722	0	N/A	0
TOTAL	9		180,982		1,005,244

TABLE F-56 (continued)

WITHOUT PROJECT TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

VENEZUELA 2013

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	5	19,272	96,360	5.68	547,645
36.00-37.99 ft. (30,000-60,000 DWT)	4	19,344	77,376	5.57	430,702
38.00-39.99 ft. (35,000-80,000 DWT)	1	26,590	26,590	5.06	134,572
>40.00 ft. (over 40,000 DWT)	0	26,722	0	N/A	0
TOTAL	10		200,326		1,112,920

2023

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	6	19,272	115,632	5.68	657,174
36.00-37.99 ft. (30,000-60,000 DWT)	4	19,344	77,376	5.57	430,702
38.00-39.99 ft. (35,000-80,000 DWT)	1	26,590	26,590	5.06	134,572
>40.00 ft. (over 40,000 DWT)	0	26,722	0	N/A	0
TOTAL	11		219,598		1,222,449

TABLE F-56 (continued)

WITHOUT PROJECT TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

VENEZUELA 2033

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	6	19,272	115,632	5.68	657,174
36.00-37.99 ft. (30,000-60,000 DWT)	5	19,344	96,720	5.57	538,377
38.00-39.99 ft. (35,000-80,000 DWT)	1	26,590	26,590	5.06	134,572
>40.00 ft. (over 40,000 DWT)	0	26,722	0	N/A	0
TOTAL	12		238,942		1,3330,124

2043

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	6	19,272	115,632	5.68	657,174
36.00-37.99 ft. (30,000-60,000 DWT)	5	19,344	96,720	5.57	538,377
38.00-39.99 ft. (35,000-80,000 DWT)	2	26,590	53,179	5.06	269,144
>40.00 ft. (over 40,000 DWT)	0	26,722	0	N/A	0
TOTAL	13		265,531		1,464,696

TABLE F-56 (continued)

WITHOUT PROJECT TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

MEDITERRANEAN

1993

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	2	19,272	38,544	13.87	534,442
36.00-37.99 ft. (30,000-60,000 DWT)	1	19,344	19,344	13.86	268,019
38.00-39.99 ft. (35,000-80,000 DWT)	0	26,590	0	13.44	0
>40.00 ft. (over 40,000 DWT)	0	26,722	0	N/A	0
TOTAL	3		57,888		802,461

2003

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	3	19,272	57,816	13.87	801,663
36.00-37.99 ft. (30,000-60,000 DWT)	1	19,344	19,344	13.86	268,019
38.00-39.99 ft. (35,000-80,000 DWT)	0	26,590	0	13.44	0
>40.00 ft. (over 40,000 DWT)	0	26,722	0	N/A	0
TOTAL	4		77,160		1,069,682

TABLE F-56 (continued)

WITHOUT PROJECT TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

MEDITERRANEAN 2013

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	3	19,272	57,816	13.87	801,663
36.00-37.99 ft. (30,000-60,000 DWT)	1	19,344	19,344	13.86	268,019
38.00-39.99 ft. (35,000-80,000 DWT)	0	26,590	9,572	13.44	128,693
>40.00 ft. (over 40,000 DWT)	0	26,722	0	N/A	0
TOTAL	4		86,732		1,198,375

2023

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	2	19,272	38,544	13.87	543,442
36.00-37.99 ft. (30,000-60,000 DWT)	2	19,344	38,688	13.86	536,038
38.00-39.99 ft. (35,000-80,000 DWT)	0	26,590	12,763	13.44	171,591
>40.00 ft. (over 40,000 DWT)	0	26,722	0	N/A	0
TOTAL	4		89,995		1,242,070

TABLE F-56 (continued)

WITHOUT PROJECT TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

MEDITERRANEAN 2033

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	2	19,272	38,544	13.87	534,442
36.00-37.99 ft. (30,000-60,000 DWT)	2	19,344	38,688	13.86	536,038
38.00-39.99 ft. (35,000-80,000 DWT)	1	26,590	26,590	13.44	357,481
>40.00 ft. (over 40,000 DWT)	0	26,722	0	N/A	0
TOTAL	5		103,822		1,427,961

2043

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	2	19,272	38,544	13.87	534,442
36.00-37.99 ft. (30,000-60,000 DWT)	2	19,344	38,688	13.86	536,038
38.00-39.99 ft. (35,000-80,000 DWT)	1	26,590	26,590	13.44	357,481
>40.00 ft. (over 40,000 DWT)	0	26,722	0	N/A	0
TOTAL	5		103,822		1,427,961

The with project transportation costs were calculated by the same method as the without project transportation costs. The only variation was in the use of the weighted average for of direct and two-port cargo tonnages and unit costs. If the with project unit cost is less than the two-port discharge unit cost without project, there is no incentive (i.e. no potential savings) for shippers to continue the two port discharge. In fact, in that case continuing the two-port discharge would be more expensive than the direct route to Canaveral. For this reason, the weighted average unit cost was abandoned, if the direct cost was lower for a given vessel and channel depth and with project transportation costs

were calculated using the direct route unit cost. An example of the with project transportation cost calculations for a 37-foot channel depth is shown in table F-57. Similar calculations were performed for channel depths of 39 and 41 feet. The results of those calculations, along with those for the without project and 37-foot depth are displayed in table F-58.

TABLE F-57

WITH 37-FOOT CHANNEL TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

COLOMBIA

1993

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	7	25,200	173,448	5.46	946,358
36.00-37.99 ft. (30,000-60,000 DWT)	4	26,520	92,851	5.51	511,317
38.00-39.99 ft. (35,000-80,000 DWT)	2	27,497	53,179	5.01	266,631
>40.00 ft. (over 40,000 DWT)	0	27,497	0	4.85	0
TOTAL	12		319,478		1,724,305

2003

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	8	25,200	192,720	5.46	1,051,508
36.00-37.99 ft. (30,000-60,000 DWT)	5	26,520	135,408	5.51	745,670
38.00-39.99 ft. (35,000-80,000 DWT)	2	27,497	53,179	5.01	266,631
>40.00 ft. (over 40,000 DWT)	0	27,497	0	5.01	0
TOTAL	15		381,307		2,063,810

TABLE F-57 (continued)

WITH 37-FOOT CHANNEL TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

COLOMBIA 2013

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	8	25,200	192,720	5.46	1,051,508
36.00-37.99 ft. (30,000-60,000 DWT)	6	26,520	154,752	5.51	852,195
38.00-39.99 ft. (35,000-80,000 DWT)	2	27,497	47,861	5.01	239,968
>40.00 ft. (over 40,000 DWT)	1	27,497	26,722	5.01	133,977
TOTAL	16		422,055		2,277,648

2023

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	8	25,200	211,992	5.46	1,156,659
36.00-37.99 ft. (30,000-60,000 DWT)	7	26,520	174,096	5.51	958,719
38.00-39.99 ft. (35,000-80,000 DWT)	2	27,497	53,179	5.01	266,631
>40.00 ft. (over 40,000 DWT)	1	27,497	26,722	5.01	133,977
TOTAL	18		465,989		2,515,986

TABLE F-57 (continued)

WITH 37-FOOT CHANNEL TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

COLOMBIA 2033

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	8	25,200	211,992	5.46	1,156,659
36.00-37.99 ft. (30,000-60,000 DWT)	7	26,520	193,440	5.51	1,065,243
38.00-39.99 ft. (35,000-80,000 DWT)	3	27,497	79,769	5.01	399,946
>40.00 ft. (over 40,000 DWT)	1	27,497	26,722	5.01	133,977
TOTAL	20		511,922		2,755,826

2043

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	8	25,200	211,992	5.46	1,156,659
36.00-37.99 ft. (30,000-60,000 DWT)	7	26,520	193,440	5.51	1,065,243
38.00-39.99 ft. (35,000-80,000 DWT)	4	27,497	106,358	5.01	533,262
>40.00 ft. (over 40,000 DWT)	2	27,497	53,443	5.01	267,955
TOTAL	22		565,234		3,023,119

TABLE F-57 (continued)

WITH 37-FOOT CHANNEL TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

VENEZUELA

1993

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	3	25,200	77,088	5.40	416,183
36.00-37.99 ft. (30,000-60,000 DWT)	1	26,520	38,688	5.36	207,393
38.00-39.99 ft. (35,000-80,000 DWT)	1	27,497	26,590	4.97	132,104
>40.00 ft. (over 40,000 DWT)	0	27,497	0	N/A	0
TOTAL	5		142,366		755,680

2003

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	4	25,200	96,360	5.40	520,228
36.00-37.99 ft. (30,000-60,000 DWT)	2	26,520	58,032	5.36	311,090
38.00-39.99 ft. (35,000-80,000 DWT)	1	27,497	26,590	4.97	132,104
>40.00 ft. (over 40,000 DWT)	0	27,497	0	N/A	0
TOTAL	7		180,982		963,422

TABLE F-57 (continued)

WITH 37-FOOT CHANNEL TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

VENEZUELA 2013

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	4	25,200	96,360	5.40	520,228
36.00-37.99 ft. (30,000-60,000 DWT)	3	26,520	77,376	5.36	414,786
38.00-39.99 ft. (35,000-80,000 DWT)	1	27,497	26,590	4.97	132,104
>40.00 ft. (over 40,000 DWT)	0	27,497	0	N/A	0
TOTAL	8		200,326		1,067,119

2023

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	5	25,200	115,632	5.40	624,274
36.00-37.99 ft. (30,000-60,000 DWT)	3	26,520	77,376	5.36	414,786
38.00-39.99 ft. (35,000-80,000 DWT)	1	27,497	26,590	4.97	132,104
>40.00 ft. (over 40,000 DWT)	0	27,497	0	N/A	0
TOTAL	8		219,598		1,171,165

TABLE F-57 (continued)

WITH 37-FOOT CHANNEL TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

VENEZUELA 2033

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	5	25,200	115,632	5.40	624,274
36.00-37.99 ft. (30,000-60,000 DWT)	4	26,520	96,720	5.36	518,483
38.00-39.99 ft. (35,000-80,000 DWT)	1	27,497	26,590	4.97	132,104
>40.00 ft. (over 40,000 DWT)	0	27,497	0	N/A	0
TOTAL	9		238,942		1,274,861

2043

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	5	25,200	115,632	5.40	624,274
36.00-37.99 ft. (30,000-60,000 DWT)	4	26,520	96,720	5.36	518,483
38.00-39.99 ft. (35,000-80,000 DWT)	2	27,497	53,179	4.97	264,208
>40.00 ft. (over 40,000 DWT)	0	27,497	0	N/A	0
TOTAL	10		265,531		1,406,965

TABLE F-57 (continued)

WITH 37-FOOT CHANNEL TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

MEDITERRANEAN

1993

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	2	25,200	38,544	13.32	513,216
36.00-37.99 ft. (30,000-60,000 DWT)	1	26,520	19,344	13.45	260,198
38.00-39.99 ft. (35,000-80,000 DWT)	0	27,497	0	13.15	0
>40.00 ft. (over 40,000 DWT)	0	27,497	0	N/A	0
TOTAL	2		57,888		773,414

2003

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	2	25,200	57,816	13.87	801,663
36.00-37.99 ft. (30,000-60,000 DWT)	1	26,520	19,344	13.86	268,019
38.00-39.99 ft. (35,000-80,000 DWT)	0	27,497	0	13.44	0
>40.00 ft. (over 40,000 DWT)	0	27,497	0	N/A	0
TOTAL	3		77,160		1,069,682

TABLE F-57 (continued)

WITH 37-FOOT CHANNEL TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

MEDITERRANEAN 2013

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	2	25,200	57,816	13.87	801,663
36.00-37.99 ft. (30,000-60,000 DWT)	1	26,520	19,344	13.86	268,019
38.00-39.99 ft. (35,000-80,000 DWT)	0	27,497	9,572	13.44	128,693
>40.00 ft. (over 40,000 DWT)	0	27,497	0	N/A	0
TOTAL	3		86,732		1,198,375

2023

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	2	25,200	38,544	13.87	534,442
36.00-37.99 ft. (30,000-60,000 DWT)	1	26,520	38,688	13.86	536,038
38.00-39.99 ft. (35,000-80,000 DWT)	0	27,497	12,763	13.44	171,591
>40.00 ft. (over 40,000 DWT)	0	27,497	0	N/A	0
TOTAL	3		89,995		1,242,070

TABLE F-57 (continued)

WITH 37-FOOT CHANNEL TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

MEDITERRANEAN 2033

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	2	25,200	38,544	13.87	534,442
36.00-37.99 ft. (30,000-60,000 DWT)	1	26,520	38,688	13.86	536,038
38.00-39.99 ft. (35,000-80,000 DWT)	1	27,497	26,590	13.44	357,481
>40.00 ft. (over 40,000 DWT)	0	27,497	0	N/A	0
TOTAL	4		103,822		1,427,961

2043

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	2	25,200	38,544	13.87	534,442
36.00-37.99 ft. (30,000-60,000 DWT)	1	26,520	38,688	13.86	536,038
38.00-39.99 ft. (35,000-80,000 DWT)	1	27,497	26,590	13.44	357,481
>40.00 ft. (over 40,000 DWT)	0	27,497	0	N/A	0
TOTAL	4		103,822		1,427,961

TABLE F-58

BUILDING CEMENT TRANSPORTATION COSTS AND SAVINGS WITHOUT PROJECT, 37', 39' AND 41' DEPTHS 1993-2043

(thousands of dollars)

WITHOUT PROJECT

ORIGIN	1993	2003	2013	2023	2033	2043	Average Annual
Colombia	1,792.5	2,143.8	2,362.5	2,609.6	2,854.8	3,127.1	2,142
Venezuela	788.0	1,005.2	1,112.9	1,222.4	1,330.1	1,464.7	989
Mediterranean	802.5	1,069.7	1,198.4	1,242.1	1,428.0	1,428.0	1,039
TOTAL	3,383.0	4,218.7	4,673.8	5,074.2	5,612.9	6,019.8	4,170.9

37-foot channel

ORIGIN	1993	2003	2013	2023	2033	2043	Average Annual
Colombia	1,724.3	2,063.8	2,277.6	2,516.0	2,755.8	3,023.1	2,063
Venezuela	755.7	963.4	1,067.1	1,171.2	1,274.9	1,407.0	948
Mediterranean	773.4	1,069.7	1,198.4	1,242.1	1,428.0	1,428.0	1,030
TOTAL	3,253.4	4,096.9	4,543.1	4,929.2	5,458.6	5,858.0	4,042.0

39-foot channel

ORIGIN	1993	2003	2013	2023	2033	2043	Average Annual
Colombia	1,694.1	2,021.7	2,228.5	2,461.0	2,693.3	2,956.4	2,022
Venezuela	746.8	950.5	1,050.6	1,154.6	1,254.7	1,384.7	935
Mediterranean	757.0	1,013.6	1,137.1	1,165.4	1,343.8	1,343.8	983
TOTAL	3,197.5	3,985.8	4,416.1	4,781.0	5,291.8	5,684.9	3,939.7

TABLE F-58

BUILDING CEMENT TRANSPORTATION COSTS AND SAVINGS WITHOUT PROJECT, 37', 39' AND 41' DEPTHS 1993-2043

(thousands of dollars)

41-foot channel

ORIGIN	1993	2003	2013	2023	2033	2043	Average Annual
Colombia	1,694	2,022	2,212	2,443	2,669	2,920	2,016
Venezuela	740	944	1,045	1,149	1,249	1,373	929
Mediterranean	757	1,014	1,115	1,137	1,284	1,284	974
TOTAL	3,191.5	3,979.8	4,371.6	4,728.0	5,201.5	5,576.5	3,919.8

TOTAL BENEFITS

AVERAGE ANNUAL BENEFITS:

37-FOOT CHANNEL	$128.8
39-FOOT CHANNEL	$231.2
41-FOOT CHANNEL	$251.0

SCRAP METAL

Scrap metal benefits were calculated by a method similar to that used for building cement benefits. Without project loading patterns were determined based on the 1988 fleet and tonnage. Unit costs were calculated for the several size classes of vessels which would benefit from a deeper channel from each of two destinations (Korea and Turkey). Without project voyage costs were calculated for a direct trip from Canaveral to the port of destination. An example of the voyage cost calculations is shown in table F-59.

TABLE F-59

VOYAGE & UNIT COST CALCULATIONS
30,000 DWT DRY BULK VESSEL
WITHOUT AND WITH PROJECT

CANAVERAL TO KOREA

DRY BULK VESSELS	Navigation - Unit Cost Calculation Channel Depth (feet) 35	37	39	41
Vessel Sizes				
DWT (long tons)	30000	30000	30000	30000
DWT (short tons)	33600	33600	33600	33600
Speed (knots)	15	15	15	15
Max. Draft (feet)	35	35	35	35
Light Load (Short tons)	2280	0	0	0
Trip Draft (feet)	33	35	35	35
Ship Cost in Port				
Docking Time (hrs)	[illegible]	1	1	1
Loading Time (hrs)	[illegible]	18	18	18
Unloading Time (hrs)	[illegible]	18	18	18
Delay at Docks (hrs)	[illegible]	1	1	1
Total Time (hrs)	[illegible]	38	38	38
Cost in Port ($/hr)	395	395	395	395
Total Cost in Port ($)	[illegible]	$15,010.00	$15,010.00	$15,010.00
Ship Cost at Sea				
Distance (naut. mi)	9884	9884	9884	9884
Time at Sea (hrs)	663.36	663.36	663.36	663.36
Avg. Tidal Delay (hrs)	0	0	0	0
Total Time at Sea (hrs)	663.36	663.36	663.36	663.36
Cost at Sea ($/hr)	530.00	530.00	530.00	530.00
Total Cost at Sea ($)	$351,582.57	$351,582.57	$351,582.57	$351,582.57

TABLE F-59 (continued)

VOYAGE & UNIT COST CALCULATIONS
30,000 DWT DRY BULK VESSEL
WITHOUT AND WITH PROJECT

Harbor Fees				
a. Origin ($)	1200	1200	1200	1200
b. Destination ($)	1200	1200	1200	1200
Cost of Entire Trip				
Total Trip Cost ($)	$367,791.77	$368,992.57	$368,992.57	$368,992.57
Cargo Tons (short)	24,720	27,000	27,000	27,000
Unit Cost ($/ton)	14.88	13.67	13.67	13.67
Cost Savings ($/ton)				
Incremental	N/A	1.21	0	0
Total	N/A	1.21	1.21	1.21

The without project transportation costs were calculated from the unit costs, average tons per vessel and number of vessels by size class. Those calculations are shown in table F-60. The 2013-2043 fleets and costs are the same as those shown for 2003.

TABLE F-60

WITHOUT PROJECT TRANSPORTATION COST
SCRAP METAL FLEETS BY DRAFT
1993-2043

KOREA

1993

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	1	24,720	24,720	14.88	367,792
36.00-37.99 ft. (30,000-60,000 DWT)	1	30,480	30,480	13.70	417,445
38.00-39.99 ft. (35,000-80,000 DWT)	1	31,428	31,428	13.94	438,169
>40.00 ft. (over 40,000 DWT)	0	30,312	0	13.69	0
TOTAL	3		86,628		1,223,406

TABLE F-60 (continued)

WITHOUT PROJECT TRANSPORTATION COST
SCRAP METAL FLEETS BY DRAFT
1993-2043

KOREA 2003

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	2	24,720	37,080	14.88	551,688
36.00-37.99 ft. (30,000-60,000 DWT)	2	30,480	45,720	13.70	626,168
38.00-39.99 ft. (35,000-80,000 DWT)	1	31,428	31,428	13.94	438,169
>40.00 ft. (over 40,000 DWT)	0	30,312	0	13.69	0
TOTAL	4		114,228		1,616,024

TURKEY

1993

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	1	24,720	24,720	8.45	209,004
36.00-37.99 ft. (30,000-60,000 DWT)	1	30,480	30,480	7.83	238,584
38.00-39.99 ft. (35,000-80,000 DWT)	0	31,428	0	7.97	0
>40.00 ft. (over 40,000 DWT)	0	30,312	0	7.85	0
TOTAL	2		55,200		447,588

TABLE F-60 (continued)

WITHOUT PROJECT TRANSPORTATION COST
SCRAP METAL FLEETS BY DRAFT
1993-2043

TURKEY 2003

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	2	24,720	37,080	8.45	313,506
36.00-37.99 ft. (30,000-60,000 DWT)	2	30,480	45,720	7.83	357,876
38.00-39.99 ft. (35,000-80,000 DWT)	0	31,428	0	7.97	0
>40.00 ft. (over 40,000 DWT)	1	30,312	30,312	7.85	237,874
TOTAL	4		113,112		909,255

The with project transportation costs were calculated by the same method as the without project transportation costs. An example of the with project transportation cost calculations for a 37-foot channel depth is shown in table F-61. Similar calculations were performed for channel depths of 39 and 41 feet. The results of those calculations, along with those for the without project and 37-foot depth are displayed in table F-62.

TABLE F-61

WITH 37-FOOT CHANNEL TRANSPORTATION COST
SCRAP METAL FLEETS BY DRAFT
1993-2043

KOREA

1993

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	1	27,000	24,720	13.65	337,833
36.00-37.99 ft. (30,000-60,000 DWT)	1	33,240	30,480	12.61	384,289
38.00-39.99 ft. (35,000-80,000 DWT)	1	34,452	31,428	12.77	401,426
>40.00 ft. (over 40,000 DWT)	0	36,840	0	12.54	0
TOTAL	3		86,628		1,123,548

2003

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	1	27,000	37,080	13.67	506,750
36.00-37.99 ft. (30,000-60,000 DWT)	1	33,240	45,720	12.61	576,433
38.00-39.99 ft. (35,000-80,000 DWT)	1	34,452	31,428	12.77	401,426
>40.00 ft. (over 40,000 DWT)	0	36,840	0	12.04	0
TOTAL	4		114,228		1,484,609

TABLE F-61 (continued)

WITH 37-FOOT CHANNEL TRANSPORTATION COST
CEMENT FLEETS BY DRAFT
1993-2043

TURKEY

1993

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	1	27,000	24,720	7.79	192,454
36.00-37.99 ft. (30,000-60,000 DWT)	1	33,240	30,480	7.23	220,279
38.00-39.99 ft. (35,000-80,000 DWT)	0	34,452	0	7.33	0
>40.00 ft. (over 40,000 DWT)	0	36,840	0	7.21	0
TOTAL	2		55,200		412,733

2003

DRAFT	Vessels	Tons per Vessel	Total Tons	Unit Cost ($/ton)	Transportation Cost ($)
34.00-35.99 ft. (20,000-50,000 DWT)	1	27,000	37,080	7.79	288,681
36.00-37.99 ft. (30,000-60,000 DWT)	1	33,240	45,720	7.23	330,418
38.00-39.99 ft. (35,000-80,000 DWT)	0	34,452	0	7.33	0
>40.00 ft. (over 40,000 DWT)	1	36,840	30,312	7.21	218,546
TOTAL	4		113,112		837,645

TABLE F-62

SCRAP METAL TRANSPORTATION COSTS AND SAVINGS WITHOUT PROJECT, 37', 39' AND 41' DEPTHS 1993-2043

(thousands of dollars)

WITHOUT PROJECT

DESTINATION	1993	2003	2013	2023	2033	2043	Average Annual
Korea	1,223.4	1,616.0	1,616.0	1,616.0	1,616.0	1,616.0	1,497.6
Turkey	447.6	909.3	909.3	909.3	909.3	909.3	770.0
TOTAL	1,671.0	2,525.3	2,525.3	2,525.3	2,525.3	2,525.3	2,267.5

WITH 37-ft channel

DESTINATION	1993	2003	2013	2023	2033	2043	Average Annual
Korea	1,123.5	1,484.6	1,484.6	1,484.6	1,484.6	1,484.6	1,375.7
Turkey	412.7	837.6	837.6	837.6	837.6	837.6	709.4
TOTAL	1,536.3	2,322.3	2,322.3	2,322.3	2,322.3	2,322.3	2,085.1

WITH 39-ft channel

DESTINATION	1993	2003	2013	2023	2033	2043	Average Annual
Korea	1,064.7	1,411.7	1,411.7	1,411.7	1,411.7	1,411.7	1,307.0
Turkey	397.2	798.2	798.2	798.2	798.2	798.2	677.2
TOTAL	1,461.9	2,209.9	2,209.9	2,209.9	2,209.9	2,209.9	1,984.2

TABLE F-62 (continued)

SCRAP METAL TRANSPORTATION COSTS AND SAVINGS
WITHOUT PROJECT, 37', 39' AND 41' DEPTHS
1993-2043

WITH 41-ft channel

DESTINATION	1993	2003	2013	2023	2033	2043	Average Annual
Korea	1,038.5	1,385.5	1,385.5	1,385.5	1,385.5	1,385.5	1,280.8
Turkey	397.2	784.5	784.5	784.5	784.5	784.5	667.6
TOTAL	1,435.7	2,169.9	2,169.9	2,169.9	2,169.9	2,169.9	1,948.4

TOTAL BENEFITS

AVERAGE ANNUAL BENEFITS

37-FOOT CHANNEL	182.4
39-FOOT CHANNEL	283.3
41-FOOT CHANNEL	319.1

APPENDIX G

PERTINENT CORRESPONDENCE

TABLE OF CONTENTS

Description and Date	Origin
Letters of Support from Local Sponsor	
15 August 1990	Canaveral Port Authority
Draft Report Coordination Letter	
25 June 1990	Jacksonville District Corps of Engineers
State Agency Review Letters	
22 August 1990	Governor, State of Florida
21 August 1990	Governor, State of Florida
15 August 1990	Governor, State of Florida
16 September 1987	Division of Historical Resources
15 September 1987	Department of Environmental Regulation
14 August 1987	Department of Natural Resources
Federal Agency Review Letters	
02 August 1990	U.S. Air Force
06 August 1990	U.S. Department of Interior, Office of Environmental Affairs
17 July 1990	U.S. Environmental Protection Agency
06 July 1990	U.S. Dept. of Housing and Urban Devel.
Other Agency Review Letters	
10 October 1989	Canaveral Pilots Association
20 March 1989	Canaveral Pilots Association
11 August 1987	City of Cocoa Beach
Endangered Species Coordination	
29 September 1989	National Oceanic and Atmospheric Admin.
22 September 1989	U.S. Fish and Wildlife Service
15 September 1989	Jacksonville District, Corps of Engineers
15 September 1989	Jacksonville District, Corps of Engineers
27 March 1989	U.S. Fish and Wildlife Service
14 March 1989	Jacksonville District, Corps of Engineers
20 June 1988	U.S. Fish and Wildlife Service
24 September 1987	U.S. Fish and Wildlife Service

PORT CANAVERAL &
FOREIGN TRADE ZONE 136
CANAVERAL PORT AUTHORITY•P.O. BOX 267•CAPE CANAVERAL, FL 32920
407-783-7831•FAX 407-784-6223/407-783-3748

15 August 1990

Colonel Bruce A. Malson
District Engineer
Jacksonville District
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Col. Malson:

The Canaveral Port Authority staff and Board of Commissioners support the selected plan of improvements for Canaveral Harbor in the draft feasibility report and environmental impact statement. The improvements are very much needed and justified as shown in the economics with a benefit-to-cost ratio of 2.05 to 1.

The Commissioners and Port staff appreciate the effort that has gone into the preparation of the draft report and are prepared to continue our support toward authorization. The Canaveral Port Authority as the local sponsor understands the local cooperation requirements and fully intends to perform its obligations for project construction, including the necessary cost sharing.

The Canaveral Port Authority intends to use retained earnings from its 5-year plan to provide the financing needed for the local cost of the proposed Federal improvements. The sources of the funds are identified in the enclosed financial plan. The signed statement of financial capability is enclosed and includes an analysis that demonstrates the projected revenues are reasonably certain and sufficient to cover our share of the costs.

Please proceed with approval and authorization of this project as soon as practicable.

Sincerely,
CANAVERAL PORT AUTHORITY

Charles M Rowland
Charles M. Rowland
Executive Director

JL:wm

15 August 1990

THE FIVE YEAR CAPITAL BUDGET AND CASH FLOW PROJECTION FOR FY 90 THROUGH 95 INCLUSIVE

Attachment 1: Executive Directors Remarks on the Proposed FY90-FY95 Capital Budget and Cash Flow Projections

Attachment 2: Canaveral Port Authority Capital Cash Flow Projections for FY 90-95

This is to certify that attachment (1) and attachment (2) are based on conservative estimates of Port revenue and capital expenditures and reflect the best information available to date.

As can be seen from line 66, page 2 of attachment (2), net cash flow from operations for FY 92 are expected to be $9,307,000 which will be more than sufficient to cover the capital requirements shown on line 28, page 1 of attachment (2) in the amount of $4.2 million for the channel widening and deepening project.

Charles M Rowland

Charles M. Rowland
Executive Director

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF
Planning Division
Navigation Section

June 25, 1990

TO THE ADDRESSEES ON THE ATTACHED LIST

The enclosed draft feasibility report and Environmental Impact Statement (EIS) provide the study results on the advisability of Federal assistance to improve navigational access and recreational opportunities at Canaveral Harbor. Corps of Engineers' guidelines require that any plan for Federal implementation must be the plan with the greatest net economic benefit, consistent with protecting the Nation's environment. The enclosed report concludes that navigational and recreational improvements are justified and warrant Federal participation in their implementation. Those findings are tentative at this time.

The recommended navigation improvements would allow deep draft vessels to call at the harbor with deeper drafts and more cargo tonnage, resulting in transportation cost savings. The recreation improvements would enhance visitation at the Canaveral Harbor Lock Park and the Jetty Park. The study addressed economic justification and environmental impacts of those improvements. Annual benefits for the recommended plan of improvement are estimated at $2,185,000, including $1,745,000 in navigation benefits and $440,000 in recreation benefits. Annual charges are estimated at $1,068,000. The recommended plan would earn $2.05 for each $1.00 invested for a benefits-to-costs ratio of 2.05 to 1.0.

The draft report and EIS are provided for your review under policies and procedures established for coordinating civil works activities. After your review, we would appreciate receiving any comments you may have by August 13, 1990. Additional copies of the report can be obtained upon request. Comments should be addresses to U.S. Army Engineer District, Attn: CESAJ-PD-N, P.O. Box 4970, Jacksonville, Fl 32232-0019. If no comments are received, we shall assume you are in agreement with the report at this time.

Sincerely,

A. J. Salem

A.J. Salem
Chief, Planning Division

Enclosures

DRAFT FEASIBILITY REPORT MAILING LIST FOR CANAVERAL HARBOR, FLORIDA

Director
Office of Federal Activities (A-104)
Environmental Protection Agency
401 M Street S.W.
Washington, DC 20024-2610 (5 cpys)

Office of Ecology & Conservation
Department of Commerce - Room 6222 (PP/EC)
14th and Constitution Avenue, N. W.
Washington, DC 20230-0001 (4 cpys)

Director
Office of Environmental Compliance
Department of Energy, Room 4G064
1000 Independence Avenue, S.W.
Washington, DC 20585

Mr. Edward R. Meyer
Federal Maritime Commission
Office of Energy & Environmental Impact
1100 L Street
Washington, DC 20005-4013

Special Programs
Center for Environmental Health
Shamblee 27
Centers for Disease Control
Atlanta, GA 30333 (2 cpys)

Mr. John Seyffert
Federal Emergency Management Admin.
Room 713
500 C. Street, SW
Washington, DC 20024-2514

Mr. Bruce Blanchard, Director
Office of Environmental Project Review
Department of the Interior, Room 4241
18th and C Streets, NW
Washington, DC 20240-0001 (12 cpys)

Executive Director
Advisory Council on Historic Preservation
The Old Post Office Building
1100 Pennsylvania Avenue, NW #809
Washington, DC 20004-2590

Florida Audubon Society
1101 Audubon Way
Maitland, FL 32751-5451

Mr. John Rains, Jr.
Isaak Walton League of Amercia, Inc.
5314 Bay State Road
Palmetto, FL 33561-9712

State Clearinghouse
Office of Planning and Budgeting
Executive Office of the Governor
The Capitol
Tallahassee, FL 32301-8074 (16 cpys)

The Nature Conservancy
Florida State Office
1353 Palmetto Avenue
Winter Park, FL 32789

Mr. Randy Armstrong, Chief
Bureau of Lab and Sp. Pro.
DER
2600 Blair Stone Road
Tallahassee, FL 32301-8241 (5 cpys)

Dr. Jorge R. Rey
Florida Medical Entomology Laboratory
Institute of Food and Agriculture Sciences
University of Florida
P. O. Box 520
Vero Beach, FL 32962-4699

Environmental Information Center of the
Florida Conservation Foundation, Inc.
1203 Orange Avenue
Winter Park, FL 32789-4968

State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
401 First Avenue, S.E.
Gainesville, FL 32601-6816

Regional Environmental Officer
Housing and Urban Development
Room 600-C
75 Spring Street, S.W.
Atlanta, GA 30303-3309

Merritt Island Executive Council, Inc
ATTN: Karen S. Andreas
617 Fifth Street
Merritt Island, FL 32953

Seventh Coast Guard District (dpl)
51 S. W. 1st Avenue
Miami, FL 33130-1608

Mr. Sheppard N. Moore
Environmental Review Section
EPA, Region IV
345 Courtland Street N.E.
Atlanta, GA 30365-2401 (5 cpys)

Regional Director
Insurance & Mitigation Division
FEMA
1371 Peachtree Street N.E.
Atlanta, GA 30309-3102

Mr. Earl J. Tullos
State Topographic Bureau, DOT
605 Suwannee Street
Mail Stop 56
Tallahassee, FL 32301-2128

U.S. Fish and Wildlife Service
Federal Building, Room 334
Brunswick, GA 31520

State Director
ASCS
U.S. Department of Agriculture
P. O. Drawer 670
Gainesville, FL 32602-0670

Southern Region Forester
U.S. Forest Service
Department of Agriculture
1720 Peachtree Road N.W.
Atlanta, GA 30309-2405

National Marine Fisheries Service
Environmental Assessment Branch
3500 Delwood Beach Road
Panama City, FL 32407-7499

National Marine Fisheries Service
Chief, Protected Species Management Br
9450 Koger Blvd.
St. Petersburg, FL 33702-2496

National Marine Fisheries Service
Chief, Marine Mammals & Endangered Species Branch
9450 Koger Blvd.
St. Petersburg, FL 33702-2496

Regional Director
U.S. Fish and Wildlife Service
75 Spring Street, S. W.
Atlanta, GA 30303-3309

Diana Shores Homeowners Association
1665 Sykes Creek Drive
Merritt Island, FL 32952

Dr. Elaine Harrington
Florida Chapter
Sierra Club
927 Delores Drive
Tallahassee, FL 32301

Commander (OAN)
Seventh Coast Guard District
909 S.E. First Avenue
Miami, FL 33131-3050
Attn: Victoria Taylor

Dr. Richard F. Morse
Project Coordinator
Greiner, Inc
P. O. Box 31646
5601 Mariner Street
Tampa, FL 33630-3416

Mr. Glen Hoskins
East Merritt Island Homeowners Assoc
1755 Pelican Drive
Merritt Island, FL 32952

East Central Florida Regional
Planning Council
1011 Wymore Road, Suite 105
Winter Park, FL 32783

Florida Wildlife Federation
P. O. Box 6870
Tallahassee, FL 32314-6870

Brevard County
Board of County Commissioners
P.O. Box 1496
Titusville, FL 32780

Gee and Jenson
Engineers, Architects, Planners, Inc.
5095 South Washington Avenue
Suite 207
Titusville, FL 32780-7317

Orlando Utilities Inc.
9035 Flounder Street
Cape Canaveral, FL 32920

Honorable Connie Mack
United States Senator
Hart Senate HOB, Suite 902
Washington, D.C. 20515-0001

Honorable Bob Graham
United States Senator
241 Dirksen Senate OB
Washington, D.C. 20515-0001

Rinker Materials Company
550 Dolphin Road
Cape Canaveral, FL 32920

Continental Cement Company
9012 Marlin Street
Cape Canaveral, FL 32920

Doliner Scrap Metal Company
P.O. Box 2053
Daytona Beach, FL 32015

Seament, Inc.
Trump Plaza
16C 525 S. Flagler Drive
Weat Palm Beach, FL 33401

Florida Wildlife Federation
4080 North Haverhill Road
West Palm Beach, FL 33407-3409

Robert J. Massarelli, Exec. Dir.
South Brevard Water Authority
P.O. Box 360382
Melbourne, FL 32936-0382

Commanding Officer
Naval Ordinance Test Unit
Attn: SPP 21
Cape Canaveral AFS, FL 32920-9998

Indian River Audubon Society
2496 Pacer Lane
Cocoa, FL 32926

Board of County Commissioners
3850 Lake Drive
West Cocoa, FL 32926

Sierra Club
Brevard County Committee
1640 Rivera Drive
Merritt Island, FL 32952

Cocoa-Rockledge Garden Club
1925 Indian River Drive South
Rockledge, FL 32955

East Merritt Island Home Owners
Association, Inc.
1725 Larchmont Court
Merritt Island, FL 32952

Committee to Save Sykes Creek
P.O. Box 431
Merritt Island, FL 32952

Brevard Mosquito Control District
P.O. Box 728
Titusville, FL 32781-0728

President
Catalina Isles
Skylark Homeowners Association
1180 Montego Bay Drive
Merritt Island, FL 32950

Mr. Dick Lee
Catalina Isles
405 Carrioca Court
Merritt Island, FL 32952

James M. Stewar
Water Resources-Mosquito Control
Division of Parasite Disease/C-23
Centers for Disease Control
Atlanta, GA 30333

Field Supervisor
U.S. Fish and Wildlife Service
3100 University Boulevard South
Jacksonville, FL 32216

National Audubon Society
Southeast Regional Office
P.O. Box 1268
Charleston, S.C. 29402-1268

City of Cocoa Beach
ATTN: Elly F. Johnson, City Mgr.
P.O. Box 280
Cocoa Beach, FL 32931-0280

Sierra Club-Brevard Group
c/o Pat Joslin
602 Dianne Road
Melbourne Beach, FL 32935-6419

Port Canaveral Towing, Inc.
P.O. Box 62
Cape Canaveral, FL 32920

Port Canaveral Pilots
P.O. Box 816
Cape Canaveral, FL 32920

Premier Cruise Lines
101 George King Boulevard
Cape Canaveral, FL 32920

Imagenet Systems, Inc.
P.O. Box 1656
Cocoa, FL 32923

Mid-Florida Freezer Warehouse, Ltd.
Port Canaveral
P.O. Box 572
Cape Canaveral, FL 32920

Belcher Oil Company
P.O. Box 25500
Miami, FL 33102-5500

Watkins Customs Brockers, Inc.
100 George King Blvd.
Cape Canaveral, FL 32920

Mr. Joseph Lapolla
Deputy Executive Director/Director of Enginee
Canaveral Port Authority
P.O. Box 267
Cape Canaveral, FL 32920 (5 cys)

Cinclantflt OAC
Naval Air Station
Oceana
Virginia Beach, VA 23460-50000

Ms. Cory Lancaster
Orlando Centennial
737 South Apollo Boulevard
Melbourne, FL 32901

City of Palm Bay
2145 Palm Bay Road NE
Palm Bay, FL 32905-3679

Cocoa Beach Chamber of Commerce
431 Riveredge Boulevard
Cocoa, FL 32922

Florida Marine Patrol
Captain
P.O. Box 2564
Titusville, FL 32781-2564

Florida Inland Navigation District
1314 Marcinski Road
Jupiter, FL 33477-9999

Florida Power and Light Company
General Engineering JGE/JB
P.O. Box 14000
Juno Beach, FL 33408-0420

Brevard County
Planning and Zoning Department
2575 N. Courtenay Parkway
Merritt Island, FL 32953-4126

Brevard Mosquito Control District
P.O. Box 728
Titusville, FL 32781-0728

City of Cocoa Beach
2 South Orlando Avenue
P.O. Box 280
Cocoa Beach, FL 32931

Brevard County
Office of Natural Resources Management
2575 N. Courtenay Parkway, R.253
Merritt Island, FL 32953-4199

Honorable Bill Nelson
2404 Rayburn House of Office Building
Washington, D.C. 20515

Director, Parks and Recreation
2575 N. Courtenay Parkway
Room 180
Merritt Island, FL 32953

Organized Fisherman of Florida
P.O. Box 740
Melbourne, FL 32902-0740

Nathaniel P. Reed
Jupiter Island
Box 375
Hobe Sound, FL 33455-0375

Sierra Club
11 Lake Julia Drive South
Ponte Vedre, FL 32082-9633

Advisory Council on Historic Preservation
ATTN: Robert R. Garvey, Jr.
1100 Pennsylvania Ave. N.W., #809
Washington, D.C. 20004-2590

Field Supervisor
U.S. Fish and Wildlife Service
P.O. Box 2676
Vero Beach, FL 32961-9712

STATE OF FLORIDA
Office of the Governor
THE CAPITOL
TALLAHASSEE, FLORIDA 32399-0001

BOB MARTINEZ
GOVERNOR

August 22, 1990

Mr. A. J. Salem, Chief
Planning Division
Department of the Army
Jacksonville District,
Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

RE: Draft Navigation Study for Canaveral Harbor, Florida
Feasibility Report and Environmental Impact Statement - 81240

SAI: FL9006271708C

Dear Mr. Salem:

The Florida State Clearinghouse, pursuant to Presidential Executive Order 12372, Gubernatorial Executive Order 83-150, the Coastal Zone Management Act and the National Environmental Policy Act, has coordinated a review of the above referenced project.

Pursuant to Presidential Executive Order 12372, the project will be in accord with State plans, programs, procedures and objectives when consideration is given to and action taken on the enclosed comments and requirements of our reviewing agencies.

Please refer to the enclosed agency comments, especially those from the Department of Environmental Regulation (DER), the Department of Natural Resources (DNR) and the Department of State (DOS).

The federal agency did not provide a federal consistency determination for this project in accordance with 15 CFR 930, subpart C. However, the State has completed a review of the project information available at this time. Based on this information, the project at this stage is consistent with the Florida Coastal Management Program. Although the State does not object to the proposed work, we have identified several issues which must be resolved as the project progresses through later stages of planning, design and funding. As required by 15 CFR 930.34 and .37, at each major point of decision-making the federal agency is required to submit a consistency determination for the State's review. The format and content of the determination are described in 15 CFR 930.34 - .39. The State's continued agreement with this project will be based, in part, on adequate reconciliation of previously identified concerns.

This letter reflects your compliance with Presidential Executive Order 12372.

Sincerely,

Karen K. MacFarland

Karen K. MacFarland, Director
State Clearinghouse

KKM/rt

Enclosure(s)

Response From: Department of Environmental Regulation
Department of Natural Resources
Department of State
Department of Transportation

cc: DER
DNR
DOS
DOT
Ted Hoehn

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Please check the appropriate box below, provide any comments on your agency's stationary and return to the State Clearinghouse by the due date. In both telephone conversation and written correspondence, please refer to the State Application Identifier (SAI) number.

Enclosure

****

	E.O. 12372	FEDERAL CONSISTENCY
TO: Director State Clearinghouse Office of Planning and Budgeting Executive Office of the Governor The Capitol Tallahassee, Florida 32399-0001 (904) 488-8114	☐ NO COMMENT ☒ COMMENTS ATTACHED	☒ CONSISTENT (COMMENTS ATTACHED) ☐ NOT CONSISTENT (COMMENTS ATTACHED)

FROM: DNR

SAI#: FL9006271708C

DIVISION/BUREAU: Executive Office

REVIEWER: David W. Arnold

DATE: 8-17-90

STATE OF FLORIDA
DEPARTMENT OF NATURAL RESOURCES

Marjory Stoneman Douglas Building • 3900 Commonwealth Boulevard • Tallahassee, Florida 32399
Tom Gardner, Executive Director

August 17, 1990

Ms. Karen MacFarland, Director
State Clearinghouse
Office of Planning and Budgeting
Executive Office of the Governor
The Capitol
Tallahassee, Florida 32399-0001

Dear Ms. MacFarland:

SAI No. FL9006271708C
Feasability Report and EIS, Canaveral Harbor Improvements

The Department of Natural Resources has reviewed the above referenced draft report and based upon the information provided we have no objections to the proposed improvements to Canaveral Harbor. We have several comments that should be forwarded to the Jacksonville District, U. S. Army Corps of Engineers, Planning Division, for incorporation in the final document.

1. Appendix C did not include a location map for the core borings. A map was telefaxed to the Department for review, however, a cleaner version should be made available for the final document.

2. References in the draft EIS (Section 4.06) and in the Feasability Report (page 51) describe the material to be excavated as consisting of sand, silt, and clay that is unsuitable for beach disposal. The description of the construction required includes relocation of a dike on the north side of the channel. The location of this existing dike is not presented in any figures within the document. Additionally, no cross-sectional views are presented which show the location of the dike, existing shoreline, and existing channel within the reach which is proposed to be widened. While the core borings included in Appendix C do not indicate substantial quantities of beach quality sand, there were no borings provided from the existing shoreline area along the northern side of the inner channel. It may be that material in this area would be suitable for some beneficial use, including beach placement. The USACE should provide additional explanation and discussion regarding the work along the northern shoreline of the inner channel and acknowledge in the EIS and Feasability Report that benefical uses will be investigated in the Design Phase of the project.

3. The location of the Candidate Canaveral Harbor Ocean Dredged Material Disposal Site proposed in the EIS does not match the latest coordinates provided by the EPA (see Enclosure 1). The location coordinates should be verifed before submitting the final report. The USACE should be advised that the Department has not concurred with the proposed designation at this time.

Sincerely,

David W. Arnold

David W. Arnold
Senior Management Analyst

cc: Grant Gelhardt

FLORIDA DEPARTMENT OF STATE
Jim Smith
Secretary of State
DIVISION OF HISTORICAL RESOURCES
R.A. Gray Building
500 South Bronough
Tallahassee, Florida 32399-0250
Director's Office (904) 488-1480
Telecopier Number (FAX) (904) 488-3353

RECEIVED
JUL 16 1990

July 9, 1990

Ms. Karen K. MacFarland, Director
State Planning and Development
Clearinghouse
Office of Planning and Budgeting
The Capitol
Tallahassee, Florida 32399-0001

In Reply Refer To:
Laura A. Kammerer
Historic Sites
Specialist
(904) 487-2333
Project File No. 901776

RE: Cultural Resource Assessment Request
SAI# FL9006271708C
U.S. Army Corps of Engineers, Jacksonville District
Navigation Study for Canaveral Harbor, Florida
Brevard County

Dear Ms. MacFarland:

In accordance with the procedures contained in 36 C.F.R., Part 800 ("Protection of Historic Properties"), we have reviewed the referenced Draft EIS and find that it includes this agency's recommendations concerning cultural resources. The inclusion of those same no effect recommendations and agency concerns in the final EIS will satisfy this agency's considerations.

If you have any questions concerning our comments, please do not hesitate to contact us. Your interest in protecting Florida's archaeological and historic resources is appreciated.

Sincerely,

Louis D. Tesar
f George W. Percy, Director
Division of Historical Resources
and
State Historic Preservation Officer

GWP/lak

For projects circulated for evaluation of consistency with the FCMP, the process is slightly different. An additional review is not necessary as your plans, policies and objectives are, inlarge part, mandated by appropriate Florida statutory authority. However, for consistency review purposes, it is suggested that your comments in response to the attached document be expressed as follows.

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Should you need additional information from the applicant for IC&RP purposes or to evaluate the consistency of the project with the FCMP, please contact the applicant for the required information and notify this office by the due date. The State Clearinghouse will promptly inform the applicant that a project review cannot be completed until such information is provided to reviewers. Should a conference be necessary, please contact this office as soon as possible. Timely response is essential in order to preserve the state's rights in both IC&RP and CZMA Consistency proceedings.

Please check the appropriate box below, provide any comments on your agency's stationary and return to the State Clearinghouse by the due date. In both telephone conversation and written correspondence, please refer to the State Application Identifier (SAI) number.

Enclosure

****

TO: Director
State Clearinghouse
Office of Planning and Budgeting
Executive Office of the Governor
The Capitol
Tallahassee, Florida 32399-0001
(904) 488-8114

E.O. 12372	FEDERAL CONSISTENCY
☐ NO COMMENT	☐ CONSISTENT (COMMENTS ATTACHED)
☑ COMMENTS ATTACHED	☐ NOT CONSISTENT (COMMENTS ATTACHED)

FROM: DOT

SAI#: FL9006271708C

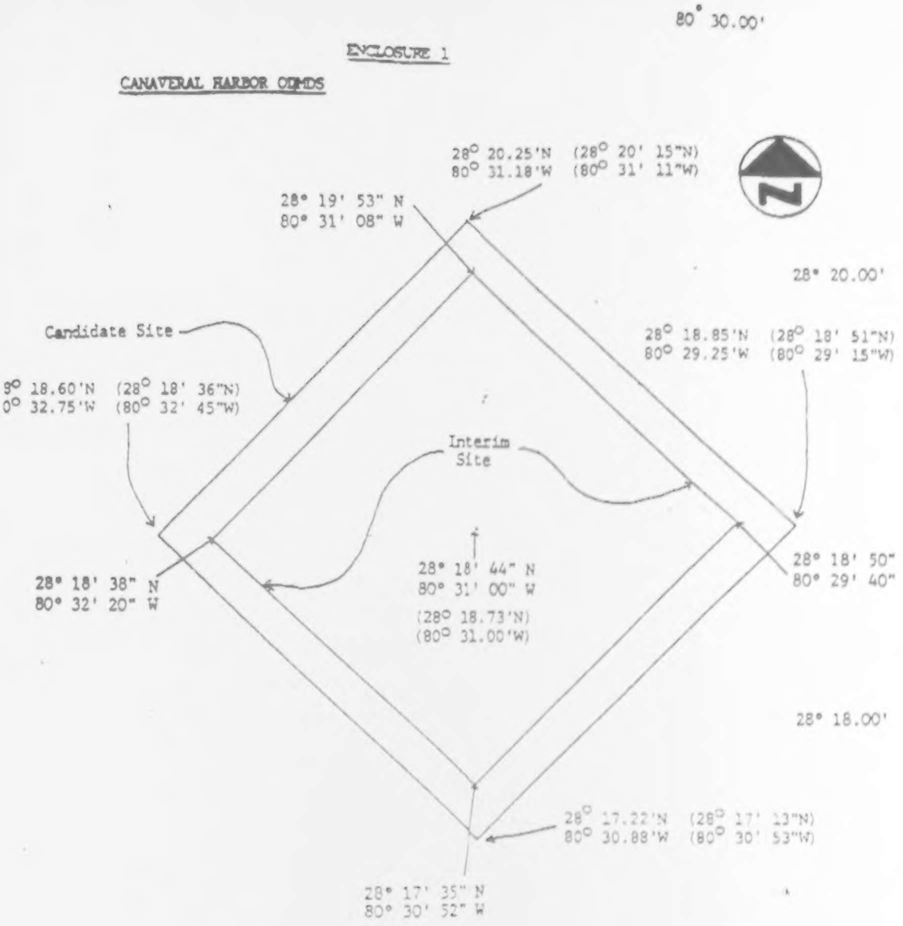
DIVISION/BUREAU:

REVIEWER: Henry Pelt

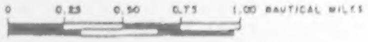
DATE: 7/19/90

ENCLOSURE 1

CANAVERAL HARBOR ODMDS


80° 30.00'
28° 20.25'N (28° 20' 15"N)
80° 31.18'W (80° 31' 11"W)
N
28° 19' 53" N
80° 31' 08" W
28° 20.00'
Candidate Site
28° 18.85'N (28° 18' 51"N)
80° 29.25'W (80° 29' 15"W)
8° 18.60'N (28° 18' 36"N)
0° 32.75'W (80° 32' 45"W)
Interim Site
28° 18' 50"
80° 29' 40"
28° 18' 38" N
80° 32' 20" W
28° 18' 44" N
80° 31' 00" W
(28° 18.73'N)
(80° 31.00'W)
28° 18.00'
28° 17.22'N (28° 17' 13"N)
80° 30.88'W (80° 30' 53"W)
28° 17' 35" N
80° 30' 52" W

INTERIM SITE WITH OVERLAPPING CANDIDATE SITE


0
0.25
0.50
0.75
1.00 NAUTICAL MILES

Florida Department of Environmental Regulation
Twin Towers Office Bldg • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400
Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary

August 3, 1990

Mr. Don Henningsen, Senior Government Analyst
Intergovernmental Coordination
Office of the Governor
413 Carlton Building
Tallahassee, Florida 32399-0001

RECEIVED
AUG 7 1990

Dear Mr. Henningsen:

RE: Draft Navigation Study for Canaveral Harbor, Florida Feasibility Report and Environmental Impact Statement, June 1990.
SAI: FL 9006271708C

The Department has reviewed the referenced document and concurs with the Corps of Engineers' selected plan. The document adequately addresses the need for channel improvements and we agree that the selected plan will not have significantly greater environmental impacts than the alternative plans. The spoil is expected to have a high silt content, so disposal of beach quality sand will not be an issue. However, we do have some concerns about the report.

During the past few years, the State has consistently objected to projects that involved ocean disposal if the Feasibility Reports and General Design Memoranda did not include detailed discussions of the status of the designation studies for the relevant Ocean Dredged Material Disposal Site (ODMDS). This failure has led to numerous confrontations between the Corps and State that could have been easily avoided by having a more thoroughly prepared document. Despite the history of these problems, the Canaveral Feasibility Report does not provide any information about the Canaveral ODMDS including the environmental protection afforded by its site management and monitoring plan. In this case, we are fortunate that EPA has submitted a Draft Environmental Impact Statement for the Canaveral ODMDS and the Department has agreed with designation of this site. Therefore EPA's timely submission of an important missing component of the Feasibility Report has prevented delays in approving this project.

On several recent occassions while dredging in Canaveral Harbor, the Corps and Navy have encountered problems with sea turtles, and these problems led to the death and severe injury of endangered species. This problem has been widely publicized, and there have been several informal discussions between Department and Corps staff regarding the problem's magnitude and potential solutions. We believe it is inappropriate for the Canaveral Feasibilty Report to have omitted any discussion of this problem. Our recent discussions with the NMFS have indicated the portion of Canaveral Harbor addressed by the Feasibility Report is not the portion of the harbor where most of the turtle problems have occurred. In addition, NMFS indicates pipeline dredges are likely to be used for the work and this type of dredge should not cause problems for the turtles. If it were not for these discussions with NMFS, we believe approval of the Feasibility Report would have delayed unnecessarily because of a lack of information.

Finally, the dimensions of the project are not clear. The Department has received a permit application from the Canaveral Port Authority that indicates a volume approximately twice that of the Corps' report. The Port Authority has informed us that they will proceed with their project regardless of federal participation. This discrepancy does not affect our review of the Corps document but this variation in project dimensions should be clarified.

We agree with the Corps' determination that the referenced project is consistent with the DER's authorities in the Florida Coastal Management Program. However, since the bases for this concurrence are not fully documented in the draft feasibility report and environmental impact statement, we request that the final document be corrected accordingly. Specifically, it should address the protection of marine resources and water quality by the management guidelines for the ODMDS and the use of special dredging procedures to protect sea turtles.

If you should have any questions please call Mickey Bryant at (904) 488-0130.

Sincerely,

Steven K. Hall
Agency Assistance Coordinator
Division of Water Management

SKH/jb

FLORIDA
BOB MARTINEZ
GOVERNOR

DEPARTMENT OF TRANSPORTATION
605 Suwannee Street, Tallahassee, Florida 32399-0450

BEN G. WATTS
SECRETARY

MEMORANDUM

DATE: July 18, 1990

TO: Sandy Whitmire

FROM: Henry Pelt, Administrator, Rail Operations

SUBJECT: SAI Number FL 9006271708 C - Canaveral Harbor Study

I have reviewed the subject report and find no specific problems with the proposed project and any Department Plans for the area. For your information and files I do offer the following comments:

The report is a 100% federally funded feasibility assessment.

The proposed project is to be funded by the U.S. Corps of Engineers and the Port Canaveral Authority.

Total cost of the project is estimated to be 10.5-14.7 millions dollars.

The project has been determined to be feasible.

Environmental Impact concerns appear to be addressed.

The project is consistent with CS 1316 as it relates to Florida Seaports Programs.

The project does not negativity impact the transportation system.

The project does not request any State Funding.

Should you require additional information or if additional information is received on this project please keep us informed.

MEP/hp

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Please check the appropriate box below, provide any comments on your agency's stationary and return to the State Clearinghouse by the due date. In both telephone conversation and written correspondence, please refer to the State Application Identifier (SAI) number.

Enclosure

E.O. 12372

FEDERAL CONSISTENCY

TO: Director
State Clearinghouse
Office of Planning and Budgeting
Executive Office of the Governor
The Capitol
Tallahassee, Florida 32399-0001
(904) 488-8114

☒ NO COMMENT

☐ COMMENTS ATTACHED

☐ CONSISTENT (COMMENTS ATTACHED)

☐ NOT CONSISTENT (COMMENTS ATTACHED)

FROM: DCA

SAI# FL900627170BC

DIVISION/BUREAU: RPM\BSP\DRI

REVIEWER: IV

DATE: 20 JULY 90

RECEIVED
JUL 12 1990
BUREAU OF STATE PLANNING
DRI SECTION

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RECEIVED
JUL 18 1990

E.O. 12372

FEDERAL
CONSISTENCY

TO: Director
State Clearinghouse
Office of Planning and Budgeting
Executive Office of the Governor
The Capitol
Tallahassee, Florida 32399-0001
(904) 488-8114

☒ NO COMMENT

☐ COMMENTS ATTACHED

☐ CONSISTENT (COMMENTS ATTACHED)

☐ NOT CONSISTENT (COMMENTS ATTACHED)

Office of the Clerk
JUL 13 PM 3 24

FROM: Marine Fisheries Commission

SAI#: FL9006271708C

DIVISION/BUREAU: MFC

REVIEWER: Bob Palmer

DATE: 7/11/90

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TO: Director State Clearinghouse Office of Planning and Budgeting Executive Office of the Governor The Capitol Tallahassee, Florida 32399-0001 (904) 488-8114	☒ NO COMMENT	☐ CONSISTENT (COMMENTS ATTACHED)
	☐ COMMENTS ATTACHED	☐ NOT CONSISTENT (COMMENTS ATTACHED)

FROM: GFWFC

SAI#: FL9006271708C

DIVISION/BUREAU: OES - Vero Beach

REVIEWER: Brian Barnett

DATE: August 3, 1990

RECEIVED
AUG 7 1990

STATE OF FLORIDA
Office of the Governor
THE CAPITOL
TALLAHASSEE, FLORIDA 32399-0001

BOB MARTINEZ
GOVERNOR

August 21, 1990

Mr. A. J. Salem, Chief
Planning Division
Department of the Army
Jacksonville District,
Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

Re: Reconnaissance-Level Study at the Lower Hillsborough River and Curiosity Creek, Florida

SAI: FL9007030003C

Dear Mr. Salem:

The Florida State Clearinghouse is awaiting additional comments from our reviewing environmental agencies, therefore, we are requesting an additional fifteen (15) days for completion of the consistency review in accordance with 15 CFR 930.41 (b).

We will make every effort to conclude the review and forward comments to you on or before September 5, 1990.

Sincerely,

Karen K. MacFarland

Karen K. MacFarland, Director
State Clearinghouse

KKM/rt

STATE OF FLORIDA
Office of the Governor
THE CAPITOL
TALLAHASSEE, FLORIDA 32399 0001

BOB MARTINEZ
GOVERNOR

August 15, 1990

Mr. A. J. Salem, Chief
Planning Division
Jacksonville District Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

RE: Draft Navigation Study for Canaveral Harbor, Florida
Feasibility Report and Draft Environmental Impact Statement

SAI: FL9006271708C

Dear Mr. Salem:

The Florida State Clearinghouse is presently reviewing the State agency responses on the above referenced document. The Clearinghouse is requesting an additional 15 day review period in accordance with 15 CFR 930.42, due to the comments submitted by State agencies. The submittal will be sent prior to August 28, 1990.

I have asked Don Henningsen to discuss with you, as frequently as is necessary, the status of the State's concerns regarding these draft documents, so that the State's concerns can be adequately addressed in the preparation of the final documents. He can be contacted at (904)488-8114.

Sincerely,

Karen K. MacFarland

Karen K. MacFarland, Director
State Clearinghouse

FLORIDA DEPARTMENT OF STATE
Jim Smith
Secretary of State
DIVISION OF HISTORICAL RESOURCES
R A. Gray Building
Tallahassee, Florida 32399-0250
(904) 488-1480

September 16, 1987

In Reply Refer to:
Mr. Robert C. Taylor
Historic Sites Specialist
(904) 487-2333
Project File No. 870772

Mr. A.J. Salem
Chief, Planning Division
U.S. Army Corps of Engineers
Jacksonville District
P.O. Box 4970
Jacksonville, Florida 32232-0019

Attn: CESAJ-PD-ES

RE: Comments Solicitation of July 24, 1987
Navigation Improvements for Canaveral Harbour,
Brevard County, Florida

Dear Mr. Salem:

In accordance with the provisions of the applicable local ordinance __ and/or Sections 253.77__, 267.061__, 380.06__, 380.061__and 403.918(2)(a)6__, Florida Statutes, and implementing state regulations, and/or in accordance with the provisions of the National Historic Preservation Act of 1966 (Public Law 89-665) as amended and related federal laws and their implementing procedures for federally involved projects✓, we have reviewed the above cited project(s) to determine its(their) effect on significant archaeological and historical sites and properties.

A review of the Florida Master Site File indicates that no significant archaeological and/or historical sites are recorded for or considered likely to be present within the project area(s)✓. Because of the project(s) nature it is considered unlikely that any such sites will be affected__. Therefore, it is the opinion of this office that the proposed project(s) will have no effect on any sites listed, or eligible for listing, in the National Register of Historic Places, or otherwise of national, state or local significance. The project(s) is(are) consistent also with Florida's coastal zone program and its historic preservation laws and concerns, and may proceed without further involvement with this agency.

If you have any questions concerning our comments, please do not hesitate to contact us. Your interest and cooperation in helping to protect Florida's archaeological and historic resources are appreciated.

Sincerely,

Louis D Tesar
f George W. Percy, Director
Division of Historical Resources
and
State Historic Preservation Officer

GWP/efk
Enclosure ( )
cc: Walt Kolb

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

September 15, 1987

Mr. A.J. Salem
Chief, Planning Division
U.S. Army Engineer District
Jacksonville
P.O. Box 4970
Jacksonville, Florida 32232-0019

ATTN: CESAJ-PD-ES

Dear Eddie:

As referenced in my August 4 letter, the following comments were made by our Division of Permitting on the proposed Canaveral Harbor improvements. We apologize for the delay in responding.

1. Sediments should be analyzed for toxic constituents, such as metals, oils, greases, nutrients and any other parameters of interest based on the adjacent land use.

2. Dissolved oxygen profiles should be provided for the existing channels under various tide conditions. Predicted dissolved oxygen profiles should be provided for each of the alternatives, if constructed.

3. Beach nourishment should be evaluated as a disposal alternative.

Thank you for the opportunity to provide comments.

Sincerely,

Jerry Brooks, Chief
Bureau of Laboratories
and Special Programs

JB/MM/pkj
cc: Mr. Walt Kolb
Mr. David Arnold
Ms. Mary Morris
Mr. John Outland

State of Florida
DEPARTMENT OF NATURAL RESOURCES

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399

TOM GARDNER
Executive Director

BOB MARTINEZ
Governor
GEORGE FIRESTONE
Secretary of State
BOB BUTTERWORTH
Attorney General
GERALD LEWIS
State Comptroller
BILL GUNTER
State Treasurer
DOYLE CONNER
Commissioner of Agriculture
BETTY CASTOR
Commissioner of Education

PLEASE ADDRESS REPLY TO

August 14, 1987

Mr. A. J. Salem
U.S. Army Engineer District, Jacksonville
Post Office Box 4970
Jacksonville, Florida 32232-0019

Attn: CESAJ-PD-ES

Re: Canaveral Harbor Improvements, Planned Environmental Impact Statement

Dear Mr. Salem:

Review of the proposed navigation improvements for the inner project area at Canaveral Harbor, Florida, indicates that substantial volumes of sediment are to be dredged from the Harbor. There is a likelihood that a large percentage of the material to be dredged is beach quality sand material. Pursuant to Section 161.142, Florida Statutes, it is the Department of Natural Resources' policy that beach quality sand material from navigational dredging be placed on adjacent beaches as beach nourishment. Accordingly, the Division of Beaches and Shores requests that the Environmental Impact Statement for the Harbor expansion project include a plan for placement of all beach compatible sand from the project on adjacent beaches south of the project. The EIS should include volumes of sand to be placed on the beach and a disposal plan for the beach including cross-section designs. Sediment core boring logs and grain size distribution analysis should be included for the dredge sites in the EIS.

Specific comments related to the Draft EIS will be provided following receipt and review of that document.

If you should have any questions, please write me at the above letterhead address or call me at (904) 488-3181.

Sincerely,

Mark E. Leadon

Mark E. Leadon, P.E. Administror
Bureau of Coastal Engineering & Regulation
Division of Beaches and Shores

MEL/jab
cc: Walt Kolb
Division Office
Bureau Office
David Arnold, DER
Bureau of State Lands Management

DEPARTMENT OF THE AIR FORCE
REGIONAL CIVIL ENGINEER, EASTERN REGION (HQ AFESC)
77 FORSYTH STREET, S.W.
ATLANTA, GEORGIA 30335-6801

REPLY TO ATTN OF: ROV

02 August 1990

SUBJECT: Air Force Review of the Draft Feasibility Report and Environmental Impact Statememt (EIS) for Cape Canaveral, FL

TO: US Army Engineer District
Attn: CESAJ-PD-N
PO Box 4970
Jacksonville, FL 32232-0019

1. As the Air Force single point of contact for coordination on environmental matters in the eastern United States, we are providing the Air Force response to the subject study. We have reviewed the study and find that the proposal will not adversely affect Air Force operations in the Cape Canaveral area.

2. Please keep our organization on your distribution list for the final study and we thank you for the opportunity to review the draft. Our point of contact is Mr George Dodson at commercial telephone number (404) 331-5313/6776.

FOR THE COMMANDER

THOMAS D. SIMS, Chief
Environmental Planning Division

cc: HQ USAF/LEEV

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Affairs
Richard B. Russell Federal Building
75 Spring Street, S.W.
Atlanta, Georgia 30303

AUG 6 1990

ER 90/589

Col. Bruce A. Malson
District Engineer, U.S. Army
Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Col. Malson:

We have reviewed the Draft Feasibility Report and Draft Environmental Statement for Canaveral Harbor, Brevard County, Florida, and have the following comments.

The documents are generally adequate regarding resources of concern to the Department of the Interior. This includes expanded project specifics, Lock Park and Jetty Park, which were not previously coordinated with this Department.

Special lighting along the fishing walkway is mentioned several times in these reports. If this lighting is in fact low pressure sodium vapor which will be recessed in such a manner as to not confuse nesting sea turtles, no reevaluation of the position taken by the Fish and Wildlife Service on endangered species is necessary.

Thank you for the opportunity to comment on these reports.

Sincerely yours,

James H. Lee

James H. Lee
Regional Environmental Officer

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

JUL 1 7 1990

Colonel Bruce A. Malson
District Engineer, Jacksonville
P.O. Box 4970
Jacksonville, FL 32232

ATTN: Mr. Rea Boothby, CESAJ-PD-ES

Subject: Feasibility Report and Draft Environmental Impact Statement (DEIS) for Canaveral Harbor (Brevard County) Florida

Dear Colonel Malson:

Pursuant to Section 309 of the Clean Air Act and Section 102 (2)(C) of the National Environmental Policy Act, EPA, Region IV has reviewed the subject document. The recommended plan calls for extending the civil works portion of the entrance channel together with deepening the inner channel, middle turning basin, and the west access channel. Disposal of approximately 1,0 million yards of predominantly silt and clay would be done in the Canaveral Harbor offshore dredged material disposal site (ODMDS) located about 9 miles southeast of the harbor entrance. The facilities at the Lock Park and Jetty Park Fishing Walkway will also be upgraded with various recreational amenities as part of the navigation proposal.

The Preliminary Section 103 Ocean Disposal Evaluation Report indicates that the sediments which will be dredged are predominantly fine grained; hence, they are subject to evaluation regarding suitability for ocean disposal. The evaluation performed in 1983 appears to have been thorough and comprehensive. However, in view of the length of time which has elapsed since this analysis, a re-evaluation of material suitability will be necessary to secure EPA's concurrence for use of the Canaveral ODMDS. This re-evaluation should be performed according to the procedures described in the Corps of Engineers/EPA guidance on evaluation of dredged material discharged in ocean waters ('green book').

Additionally, in Section 6, Environmental Impacts of Ocean Disposal, the decision-making process of items a-h should be documented in brief summary form, including reference to existing documents, i.e., the EIS for the Canaveral ODMDS, etc.. Until these issues are addressed the statements in Section 7, Determination and Findings, can not be supported.

On the basis of our review a rating of EC-2 has been assigned to the proposed action. That is, we have a degree of environmental concern regarding the suitability of putting fine grained sediments from the harbor into the ODMDS until the testing procedure for this material is re-accomplished. The results of this updated evaluation should be included in the Final EIS.

Thank you for the opportunity to comment on this action. If we can be of further assistance in this matter, Dr. Gerald Miller (404-347-3776) will serve as initial point of contact.

Sincerely yours,

Heinz Mueller

Heinz J. Mueller, Chief
Environmental Policy Section
Federal Activities Branch

U.S. Department of Housing and Urban Development

Atlanta Regional Office, Region IV
Richard B Russell Federal Building
75 Spring Street, S.W
Atlanta, Georgia 30303-3388

July 6, 1990

Mr. A. J. Salem, Chief
Planning Division Department
  of the Army
Jacksonville District Corps of Engineers
P. O. Box 4970
Jacksonville, Florida   32232-0019

Dear Mr. Salem:

This refers to your letter dated June 25, 1990, transmitting the draft feasibility report and Environmental Impact Statement (EIS) for navigational improvements at Canaveral Harbor, Florida.

Our review indicates there will be no significant adverse impact on any HUD programs as a result of this action.

Thank you for the opportunity to review and comment on the proposed project.

Very truly yours,

Ivar O. Iverson
Regional Environmental Officer

CANAVERAL PILOTS ASSOCIATION
P. O. BOX [illegible]
CAPE CANAVERAL, FLORIDA [illegible]
Area Code [illegible]
Telephone [illegible]

ENCL. 5

October 10, 1989

U. S. Army Corps of Engineers
Jacksonville District
P. O. Box 4970
Jacksonville, FL 32232-0019
Attn: CESAJ-PD-N
Mr. Marvin Bailey

RE: Widening Inner Reach, Port Canaveral Channel

Gentlemen:

In my letter of March 20, 1989, I outlined reasons why Port Canaveral channel should be widened.

I would like to add some incidents and accidents that should have been included in the aforementioned letter.

Pilot Fred Jonassen, inbound with the Tanker Pecos on the morning of May 11, 1987 and abeam Cruise Terminal 3, lost control when the Pecos took a "dive" to the south, caused by the uneven volume of water on each side. In other words, bank cushion effect. I am sure that we all understand the effect of suction and shear in narrow channels.

The Corps is planning on deepening the Port. This will mean that we will be negotiating the narrow channel with larger and deeper ships. In my opinion, it would be very prudent to widen the channel at the same time.

From the standpoint of safety alone, the expenditure should be justifiable. We certainly do not like to think about another Valdez incident. Had the Pecos incident occurred thirty seconds sooner, she would have rammed the Sea Escape passenger ship berthed at Cruise Terminal 2. Thirty seconds later, a collision with the east end of Commercial Wharf would have resulted in disaster, pollution, possible loss of life, fire, etc.

If an economic justification is necessary, in my professional opinion if the channel is widened to 400 ft the use of tugs at the Port could be reduced by approximately 25%.

Widening the channel to the north would be preferable to a 50/50 split to provide a greater margin of safety from the ships berth at the Marginal Wharf.

We handle a lot of nuclear submarines. Though they experience less bank cushion effect, the potential is there for that other type of disaster the world worries about, nuclear.

Two weeks ago, the newest Trident Submarine, the USS Pennsylvania, SSBN, ran aground while negotiating the turn from the outer to the middle reach. She struck hard just south of Beacon 12. Though this had nothing to do with the narrow channel, it does show us the potential for disaster even under normal conditions. The grounding was actually caused by a mix up of helm orders.

The 300-foot wide inner reach in Port Canaveral is a definite hazard to navigation and should be widened.

Please let me know if I can be of further service.

Sincerely,

Stephen DaCosta
STEPHEN DaCOSTA, PRES.
Chief Pilot

SD:klt

CANAVERAL PILOTS ASSOCIATION
P.O. BOX 816
CAPE CANAVERAL, FLORIDA 32920
Area Code 305
Telephone 783-4645

U.S. ARMY CORPS OF ENGINEERS
JACKSONVILLE DISTRICT
P.O. BOX 4970
JACKSONVILLE, FL. 32232-0019
ATTEN: CESAJ-PD-N
MR. MARVIN BAILEY

20 MARCH 89

REF: WIDENING INNER REACH, PORT CANAVERAL CHANNEL

GENTLEMEN:

As you know the trend toward larger & deeper vessels is snowballing.

The Channel narrows from 400' to 300' at the East end of the Inner Reach immediately South of Beacon # 3. Inbound with large deep ships "smelling the bottom"' we have to allow for a severe shear to the North at this point. The situation can be critical especially when we have to use a little extra speed to over come the effects of high winds.

On the South side of the Inner Reach between the East and Middle Turning Basins are Cruise Terminals #2, 3, & 4. On Mondays and Fridays all three are occupied. Beginning in March on Sundays and Thursdays #2, & 3 will be occupied. Seven days a week #2 is occupied by the day Cruise . Sea Escape.

Needless to say the situation again becomes critical when we are forced to use speed in order to maintain control during periods of high winds while these berths are occupied. We have had several instances of heavy surging and some damage to companion ways, parted mooring hawsers, etc.

Far too often we experience delays due to the restriction of not being able to meet or overtake in the Narrow Channel, even with smaller vessels. Sometimes the United States Coast Guard experiences delays in transiting the Channel because of commercial traffic. They are usually thoughtful enough to check traffic conditions with us in advance.

We also feel that widening the Channel would allow us to negotiate the Turn into and out of the East Basin to and from the West which would mean a considerable cost of savings in time and money by the U.S. Air Force and the U.S.Navy. At present we must depart to sea and return to accomplish a Basin to Basin Shift.

All things considered , we feel that widening the Channel as proposed and discussed would certainly be economically feasible and a great assett to Port Canaveral Commercially , and present definite added safety for all concerned.

As you know Port Canaveral is considered a Military Port and the Military is afforded every possible privilege by all concerned. Port Canaveral is a training facility for the U.S. Navy DASO Operations. During these operations, time becomes a very critical factor. Widening the Channel would certainly mean fewer delays caused by meeting and overtaking commerical fishing vessels with their booms extended , etc.

If I can be of further service, please feel free to call on me.

Sincerely,

Stephen DaCosta

-Stephen DaCosta ,Pres.
Chief Pilot

City of Cocoa Beach

(305) 783-4911

Excellent Recreation and Quality Living

2 South Orlando Avenue | P.O. Box 280 • Cocoa Beach, FL 32931

August 11, 1987

U.S. Army Engineer District Jacksonville
P. O. Box 4970
Jacksonville, FL 32232-0019
ATTN: CESAJ-PD-ES

CERTIFIED MAIL

Re: Navigation Improvements For The Inner Project Area At
Canaveral Harbor, Florida

Dear Sirs,

We are in receipt of your letter dated July 24, 1987, soliciting our views on the navigation improvements for the Canaveral Harbor Area, Florida. As you know that the City of Cocoa Beach is essentially a beach going community. Over the years, Cocoa Beach has lost a fair amount of beach area, more so after the construction of Canaveral Piers. We have been eversince trying very hard to restore some of the beach areas within our limited economic means. In 1986, with the cooperation of DNR we successfully completed our beach scraping project over a stretch of approximately three (3) miles. We tried to do the beach scraping again this year but got turned down by all the three permitting agencies ie; DNR, DER, & The Army Corps of Engineers. The reason given to us for the denial was that our beach scraping will deprive the South shores of their share of sand associated with the North East Winds. If this logic is valid then any depth or width improvements in the Canaveral Harbor area will deprive us of our share of sand from the North East Winds. Our beach system would therefore be loosing more sand than what would be getting in causing further loss in our beach area. We strongly protest these conflicting approaches by the permitting agencies and request that a uniform policy be adopted. We cannot allow further loss of our beaches by the same action which denied us of protecting our remaining beach areas.

We thank you for giving us an opportunity to express our concern. Should you have further questions please feel free to call me at (305) 783-4911, ext. 223.

Sincerely,

Rajesh Verma
City Engineer

RV:ds

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
9450 Koger Boulevard
St. Petersburg, FL 33702

September 29, 1989 F/SER23:TLD

Mr. A. J. Salem
Chief, Planning Division
U.S. Dept. of the Army
Jacksonville District, COE
Post Office Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Salem:

This responds to your September 15, 1989, letter regarding the proposed plan to maintenance dredge the inner reaches of the Canaveral Harbor Channel, Brevard County, Florida. A Biological Assessment (BA) was submitted pursuant to Section 7 of the Endangered Species Act of 1973 (ESA).

We have reviewed the BA and concur with your determination that populations of endangered/threatened species under our purview would not be adversely affected by the proposed action. However, this concurrence is based on implementation of the following recommendations provided by the COE.

1. Prior to construction, Contractor should conduct a short information program for its employees regarding pertinent aspects of sea turtle protection. This program should include slides or films to familiarize all involved personnel with sea turtles, their habits, endangered status, and associated penalties.

2. The Contractor will instruct all personnel associated with the construction of the project about the presence of sea turtles in the area, and the need to avoid collisions with them. All vessels associated with the project shall operate at "no wake" speeds at all times while in shallow waters, or channels, where the draft of the boat provides less than 3 feet clearance of bottom. Vessels transporting personnel in the project area shall follow routes of deep water to the extent possible. A lookout will be posted on all vessels during periods of operation to aid in locating sea turtles. All personnel should be advised that there are civil and criminal penalties for harming, harassing, or killing sea turtles which are protected under the ESA of 1973, as amended.

3. The Contractor shall be held responsible for any sea turtles harmed, or killed as a result of the construction of the project.

4. The Contractor will keep a log detailing all sightings, collisions, injury to, or killing of sea turtles which occur during the construction period. Any collision with a sea turtle resulting in death or injury to the animal shall be reported immediately to the Chief, Environmental Resources Branch (Jacksonville District), and the National Marine Fisheries Service (St. Petersburg). Following project completion, a report summarizing the above incidents shall be submitted to the Chief, Environmental Resources Branch.

5. To insure that any whales occurring in the vicinity of the offshore disposal area are not harmed, an observer will be posted on any vessel used for disposal activities, if disposal occurs during the time of the year in which whales may be present.

This concludes consultation responsibilities under Section 7 of the ESA. However, consultation should be reinitiated if new information reveals impacts of the identified activity that may affect listed species or their critical habitat, a new species is listed, the identified activity is subsequently modified or critical habitat determined that may be affected by the proposed activity.

If you have any questions, please contact Dr. Terry Henwood, Fishery Biologist at 813/893-3366.

Sincerely yours,

Charles A. Oravetz

Charles A. Oravetz, Chief
Protected Species Management
Branch

cc: F/PR2
F/SER1

United States Department of the Interior
FISH AND WILDLIFE SERVICE
3100 University Blvd. South
Suite 120
Jacksonville, Florida 32216

September 22, 1989

Mr. A.J. Salem
Chief, Planning Division
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Salem:

This responds to your letter of September 16, 1989, concerning navigation improvements at Port Canaveral, Florida.

As indicated in past correspondence, the Service's primary concern with this project has been the impact the project may have on the West Indian manatee.

We have reviewed each of the alternatives listed for this project in reference to the manatee and find that our direction to you, as stated in our letter of March 27, 1989, remains valid. Regardless of the alternative selected, it is imperative that the construction precautions attached to your letter of March 14, 1989 be implemented. With the exception of the concerns expressed about manatees and sea turtles, we do not feel that the alternatives listed will have significant, long-term environmental effects on fish and wildlife resources.

In addition, we continue to recommend that concerns with the impact of this project on the sea turtles using the area continue to be coordinated with the National Marine Fisheries Service.

These represent the recommendations of the Department of the Interior. Thank you for the opportunity to comment.

Sincerely yours,

David J. Wesley
Field Supervisor

September 15, 1989

Boothby

Planning Division
Environmental Resource Branch

Mr. David J. Wesley
U.S. Fish and Wildlife Service
3100 University Boulevard South
Jacksonville, Florida 32216-2719

Dear Mr. Wesley:

By letter of July 24, 1987, the Corps requested Fish and Wildlife Service comments on considered navigation improvements at Canaveral Harbor, Florida. By letter of September 24, 1987, the Vero Beach Field office responded, (copy enclosed) stating that a potential impact to endangered species existed and that the considered action should be coordinated with the FWS and National Marine Fisheries Service under the Endangered Species Act. Section 7 coordination was initiated by our letter of March 14, 1987 and responded to by the FWS in a letter dated March 27, 1988. Other than consideration of endangered species, the FWS did "not anticipate any significant long-term environmental effect on fish and wildlife resources".

The Corps is now preparing the Feasibility Report for the considered action, with the same array of alternatives as described in the scoping letter and Reconnaissance Report. We are requesting your comments on the considered alternatives under the Fish and Wildlife Coordination Act.

Sincerely,

/s/

A. J. Salem
Chief, Planning Division

Boothby/CESAJ-PD-ES/3453
pkp 9/14/89
Atmar/CESAJ-PD-ES
Smith/CESAJ-PD-E
Davis/CESAJ-PD-A
Salem/CESAJ-PD

September 15, 1989

Planning Division
Environmental Resource Branch

Mr. Charles A. Oravetz
Chief, Protected Species Management Branch
National Marine Fisheries
Southeast Regional Office
9450 Koger Boulevard
St. Petersburg, Florida 33702

Dear Mr. Oravetz:

Enclosed is biological information (enclosure 1) prepared by the Corps of Engineers under Section 7 of the Endangered Species Act concerning the proposed navigation improvements of the inner channel at Canaveral Harbor, Florida.

Based on the enclosed biological information, the Corps has determined that the proposed action will not affect any threatened or endangered species or critical habitat.

This completes coordination under the Act unless new information should indicate that the proposed action is substantially modified or a new species is listed or proposed for listing which may be affected by the proposed action or you request consultation. Your response to this notification is requested.

Sincerely,

A. J. Salem
Chief, Planning Division

Enclosures

Boothby/CESAJ-PD-ES/3453
pkp 9/14/89
Atmar/CESAJ-PD-ES
Smith/CESAJ-PD-E
Davis/CESAJ-PD-A
Salem/CESAJ-PD

Enclosure 1

BIOLOGICAL INFORMATION
NAVIGATION IMPROVEMENTS
CANAVERAL HARBOR, FLORIDA

1. Location. The site of the proposed activity is Canaveral Harbor, Brevard County, Florida (figure 1).

2. Identification of Listed Species and Critical Habitat in the Area of the Proposed Activity. The Corps has identified the manatee bald eagle, wood stork, peregrine falcon, and green, leatherback, loggerhead, Ridley, and hawksbill sea turtles as possibly occurring in the area. The Banana River, critical habitat for the manatee, is immediately west of the project area.

3. Description of Proposed Activity. The Corps is presently considering the following array of alternatives (figure 1):

a. incremental deepening of the inner channel from the existing depth of 36 feet to 43 feet between the entrance channel and middle basin;

b. assuming maintenance of incremental depths between the authorized port project depth of 37 feet in the entrance channel and the existing Navy project depth of 44 feet;

c. incremental deepening of a turning basin in the middle basin from an existing depth of 35 feet to 42 feet;

d. incremental deepening of the channel between the middle basin and west basin from an authorized depth of 31 to 42 feet;

e. assuming maintenance of 35-foot depths in the west basin to be provided by the Port Authority; and

f. widening of the inner channel bottom width from 300 to 400 feet.

The material to be dredged is unsuitable for upland or beach disposal and will be disposed of in the EPA-interim approved offshore dredged material disposal site.

4. Assessment of Potential Impacts of the Proposed Activity on Listed Species. Dredging, per se, should not affect manatees in the channel area. A number of precautions, discussed in paragraph 5. below, will be taken to ensure that project activities do not adversely affect the manatee.

Although the project area is within the range of the bald eagle, wood stork, and peregrine falcon, the surrounding area is so heavily developed that it is not suitable habitat for any of those species. The project, therefore, should have no impact on any of the three species.

5. **Efforts to Eliminate Potential Impacts on Listed Species or Critical Habitat.** Construction activities will be kept under surveillance, management, and control to minimize interference with disturbance of, or damage to, fish and wildlife. The surveillance, management, and control will be performed by either the Corps or the Contractor, depending upon who performs the work. Contract work is under the supervision of the Corps of Engineers.

The following requirements will be put in the Contract Plans and Specifications to ensure that manatees and sea turtles are not affected.

During construction the Contractor should conduct a short information program for his employees regarding pertinent aspects of manatee and sea turtle protection. This program should include slides or films to familiarize all involved personnel with manatees and sea turtles, their habits, endangered status, and associated penalties.

The Contractor will instruct all personnel associated with the construction of the project about the presence of manatees and/or sea turtles in the area and the need to avoid collisions with them. All vessels associated with the project shall operate at "no wake" speeds at all times while in shallow water, or channels, where the draft of the boat provides less than 3-foot clearance of bottom. Vessels transporting personnel in the area shall follow routes of deep water to the extent possible. A lookout will be posted on all vessels during periods of operation to aid in locating manatees or sea turtles. All personnel should be advised that there are civil and criminal penalties for harming, harassing, or killing manatees or sea turtles which are protected under the Endangered Species Act of 1979, as amended, the Marine Mammal Protection Act of 1972, and Section 370.12, Florida Statutes. The Contractor shall be held responsible for any manatee or sea turtle harmed, harassed, or killed as a result of the construction of the project.

The Contractor will keep a log detailing all sightings, collisions, injury to, or killing of manatees or sea turtles which occur during the construction period. Any collision with a manatee or sea turtle resulting in death or injury to the animal shall be reported immediately to the Chief, Environmental Resources Branch (Jacksonville District), and the U.S. Fish and Wildlife Service (Jacksonville Area Office). Following project completion, a report summarizing the above incidents shall be submitted to the Chief, Environmental Resources Branch.

United States Department of the Interior
FISH AND WILDLIFE SERVICE
3100 University Blvd. South
Suite 120
Jacksonville, Florida 32216

March 27, 1989

Mr. A.J. Salem
Chief, Planning Division
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

FWS Log No. 4-1-89-166

Dear Mr. Salem:

This responds to your letter of March 14, 1989, in accordance with Section 7 of the Endangered Species Act of 1973, as amended, on the proposed navigation improvements at Canaveral Harbor, Brevard County. The project calls for deepening sections of the inner channel within the port, and disposing of the material in an open ocean disposal site. The Corps evaluated the impact this project would have on the manatee, bald eagle, wood stork, peregrine falcon, and green, leatherback, loggerhead, Kemp's (Atlantic) Ridley and hawksbill sea turtles, and based on a number of precautions stipulated in the permit, determined a no effect for all species. With reference to the sea turtles, the Service has responsibility only when they are on land, otherwise the responsibility lies with the National Marine Fisheries Service (NMFS). We therefore, recommend that the Corps consult with NMFS on the turtles.

Manatees may be observed in Port Canaveral year round, and it is imperative that the construction precautions outlined in the your letter be strictly followed. Based on our review of the project and the safety measures proposed, we concur with the Corps' determination of no effect on all species, with the exception that sea turtle impacts need to be coordinated with NMFS.

Although this does not represent a Biological Opinion as described in Section 7 of the Act, it does fulfill the requirements, and no further action is required. If modifications are made in the project, please notify our office.

Sincerely yours,

David Wesley

David J. Wesley
Field Supervisor

MAR 14 1989

Planning Division
Environmental Resources Branch

Mr. David J. Wesley
Field Supervisor
U.S. Fish and Wildlife Service
3100 University Boulevard North
Suite 120
Jacksonville, Florida 32216

Dear Mr. Wesley:

Enclosed is biological information (enclosure 1) prepared by the Corps of Engineers under Section 7 of the Endangered Species Act concerning the proposed navigation improvements at Canaveral Harbor, Florida.

Based on the enclosed biological information, the Corps has determined that the proposed action will not affect any threatened or endangered species' habitat.

This completes coordination under the Act unless new information should indicate that the proposed action is substantially modified or a new species is listed or proposed for listing which may be affected by the action, or you request consultation. Your response to this notification is requested.

Sincerely,

A. J. Salem
Chief, Planning Division

Enclosure

Enclosure 1

BIOLOGICAL INFORMATION
NAVIGATION IMPROVEMENTS
CANAVERAL HARBOR, FLORIDA

1. Location. The site of the proposed activity is Canaveral Harbor, Brevard County, Florida (figure 1).

2. Identification of Listed Species and Critical Habitat in the Area of the Proposed Activity. The Corps has identified the manatee bald eagle, wood stork, peregrine falcon, and green, leatherback, loggerhead, Ridley, and hawksbill sea turtles as possibly occurring in the area. The Banana River, critical habitat for the manatee, is immediately west of the project area.

3. Description of Proposed Activity. The Corps is presently considering the following array of alternatives (figure 1):

a. incremental deepening of the inner channel from the existing depth of 36 feet to 43 feet between the entrance channel and middle basin;

b. assuming maintenance of incremental depths between the authorized port project depth of 37 feet in the entrance channel and the existing Navy project depth of 44 feet;

c. incremental deepening of a turning basin in the middle basin from an existing depth of 35 feet to 42 feet,

d. incremental deepening of the channel between the middle basin and west basin from an authorized depth of 31 to 42 feet,

e. assuming maintenance of 35-foot depths in the west basin to be provided by the Port Authority, and

f. widening of the inner channel bottom width from 300 to 400 feet.

The material to be dredged is unsuitable for upland or beach disposal and will be disposed of in the EPA-interim approved offshore dredged material disposal site.

4. Assessment of Potential Impacts of the Proposed Activity on Listed Species. Dredging, per se, should not affect manatees in the channel area. A number of precautions, discussed in paragraph 5. below, will be taken to ensure that project activities do not adversely affect the manatee.

Although the project area is within the range of the bald eagle, wood stork, and peregrine falcon, the surrounding area is so heavily developed that it is not suitable habitat for any of those species. The project, therefore, should have no impact on any of the three species.

5. Efforts to Eliminate Potential Impacts on Listed Species or Critical Habitat. Construction activities will be kept under surveillance, management, and control to minimize interference with disturbance of, or damage to, fish and wildlife. The surveillance, management, and control will be performed by either the Corps or the Contractor, depending upon who performs the work. Contract work is under the supervision of the Corps of Engineers.

The following requirements will be put in the Contract Plans and Specifications to ensure that manatees and sea turtles are not affected.

During construction the Contractor should conduct a short information program for his employees regarding pertinent aspects of manatee and sea turtle protection. This program should include slides or films to familiarize all involved personnel with manatees and sea turtles, their habits, endangered status, and associated penalties.

The Contractor will instruct all personnel associated with the construction of the project about the presence of manatees and/or sea turtles in the area and the need to avoid collisions with them. All vessels associated with the project shall operate at "no wake" speeds at all times while in shallow water, or channels, where the draft of the boat provides less than 3-foot clearance of bottom. Vessels transporting personnel in the area shall follow routes of deep water to the extent possible. A lookout will be posted on all vessels during periods of operation to aid in locating manatees or sea turtles. All personnel should be advised that there are civil and criminal penalties for harming, harassing, or killing manatees or sea turtles which are protected under the Endangered Species Act of 1979, as amended, the Marine Mammal Protection Act of 1972, and Section 370.12, Florida Statutes. The Contractor shall be held responsible for any manatee or sea turtle harmed, harassed, or killed as a result of the construction of the project.

The Contractor will keep a log detailing all sightings, collisions, injury to, or killing of manatees or sea turtles which occur during the construction period. Any collision with a manatee or sea turtle resulting in death or injury to the animal shall be reported immediately to the Chief, Environmental Resources Branch (Jacksonville District), and the U.S. Fish and Wildlife Service (Jacksonville Area Office). Following project completion, a report summarizing the above incidents shall be submitted to the Chief, Environmental Resources Branch.

United States Department of the Interior
FISH AND WILDLIFE SERVICE
3100 University Blvd. South
Suite 120
Jacksonville, Florida 32216

June 20, 1988

Colonel Robert L. Herndon
District Engineer
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Attention: CESSAJ-PD-ES

Dear Colonel Herndon:

This is in response to the notice in the Federal Register requesting comments on the Corps' intent to prepare a Draft Environmental Impact Statement (DEIS), for enlarging the inner channel at Canaveral Harbor, Brevard County, Florida.

The work calls for deepening the channel and enlarging the turning basin. As the Corps is aware, Port Canaveral has manatees on a year-round basis, and dredging has the potential of impacting this species. As stated in the notice, the Corps will consult with the Service on this project in accordance with Section 7 of the Endangered Species Act.

With reference to the disposal of the dredged material, the Service prefers that an existing upland disposal site or an EPA approved open ocean disposal site be used rather than filling wetlands. Destroying wetlands in the Canaveral area will have an impact on the endangered wood stork.

We look forward to reviewing the DEIS.

Sincerely yours,

David J Wesley

David J. Wesley
Field Supervisor

United States Department of the Interior
FISH AND WILDLIFE SERVICE
P.O. BOX 2676
VERO BEACH, FLORIDA 32961-2676

September 24, 1987

Colonel Robert L. Herndon
District Engineer
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Colonel Herndon:

On July 24, 1987, you advised us of a study of navigation improvements proposed for the inner project area at Canaveral Harbor, Florida. We have examined the alternatives that you briefly described, in light of our knowledge of existing conditions. As you noted, there is potential to impact endangered species, and these will be addressed by the National Marine Fisheries Service and by the Jacksonville Office of the Fish and Wildlife Service. Other than that, we do not anticipate any significant long-term environmental effect on fish and wildlife resources.

We look forward to working with you and your staff in detailed project planning.

Sincerely yours,

Joseph D. Carroll
Field Supervisor

cc:
SE, Jacksonville, FL

APPENDIX H

LOCAL COOPERATION

A copy of the draft report with the items of local cooperation for the selected plan in this report was sent to the sponsor, Canaveral Port Authority. The sponsor reviewed the selected plan and the items of local cooperation and agrees with that plan of improvement for navigation and recreation. In support of the selected plan the sponsor provided a letter which follows this page. The sponsor also provide a financial plan for the cost sharing on the selected plan. That plan is included as an enclosure to the letter. The sponsor has a strong capital budget and cash flow projections for Fiscal Year 1990 through 1995 with allowances for capital expenditures related to the project as well as cost sharing for the selected plan.

PORT CANAVERAL &
FOREIGN TRADE ZONE 136
CANAVERAL PORT AUTHORITY•P.O. BOX 267•CAPE CANAVERAL, FL 32920
407-783-7831•FAX 407-784-6223/407-783-3748

15 August 1990

Colonel Bruce A. Malson
District Engineer
Jacksonville District
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Col. Malson:

The Canaveral Port Authority staff and Board of Commissioners support the selected plan of improvements for Canaveral Harbor in the draft feasibility report and environmental impact statement. The improvements are very much needed and justified as shown in the economics with a benefit-to-cost ratio of 2.05 to 1.

The Commissioners and Port staff appreciate the effort that has gone into the preparation of the draft report and are prepared to continue our support toward authorization. The Canaveral Port Authority as the local sponsor understands the local cooperation requirements and fully intends to perform its obligations for project construction, including the necessary cost sharing.

The Canaveral Port Authority intends to use retained earnings from its 5-year plan to provide the financing needed for the local cost of the proposed Federal improvements. The sources of the funds are identified in the enclosed financial plan. The signed statement of financial capability is enclosed and includes an analysis that demonstrates the projected revenues are reasonably certain and sufficient to cover our share of the costs.

Please proceed with approval and authorization of this project as soon as practicable.

Sincerely,
CANAVERAL PORT AUTHORITY

Charles M Rowland

Charles M. Rowland
Executive Director

JL:wm

15 August 1990

THE FIVE YEAR CAPITAL BUDGET AND CASH FLOW PROJECTION

FOR FY 90 THROUGH 95 INCLUSIVE

Attachment 1:	Executive Directors Remarks on the Proposed FY90-FY95 Capital Budget and Cash Flow Projections
Attachment 2:	Canaveral Port Authority Capital Cash Flow Projections for FY 90-95

This is to certify that attachment (1) and attachment (2) are based on conservative estimates of Port revenue and capital expenditures and reflect the best information available to date.

As can be seen from line 66, page 2 of attachment (2), net cash flow from operations for FY 92 are expected to be $9,307,000 which will be more than sufficient to cover the capital requirements shown on line 28, page 1 of attachment (2) in the amount of $4.2 million for the channel widening and deepening project.

Charles M Rowland

Charles M. Rowland
Executive Director

CANAVERAL PORT AUTHORITY

August 6, 1990

MEMORANDUM

To: Commissioners of Port Canaveral

From: Executive Director

Subj: Remarks on the Proposed FY90-FY95 Capital Budget and Cash Flow Projections

1. ENCLOSURE: Enclosed on the right side opposite this memo is a copy of the Proposed FY90-FY95 Capital Budget and Cash Flow Projections. Note that line 43 shows the total capital requirements for each year, line 45 shows estimated operating revenues, line 66 shows the estimated net cash from operations available for capital projects and payment of bond principal, line 67 shows the estimated new financing necessary to finance capital projects, lines 75 through 93 show the estimated payments on bond principal, and line 99 shows the estimated ending cash reserve for working capital and emergencies.

2. FY91 REQUIREMENTS: Total capital requirements for FY91 are estimated at $16.004 million. The major projects include completion of CT#5 ($6.133 million), construction of CT#1 ($3.0 million), stretching CT#2 and adding to parking lot ($2.021 million), and the completion of the cargo pier south of TB#2 ($1.8 million). It will be necessary to finance about $7 million of this with the remainder funded from cash flow.

3. FY92 REQUIREMENTS: Total capital requirements for FY92 are estimated at $6.985 million. Major projects include the design of CT#8 and CT#9 ($1.3 million), and completion of the fishing fleet basin bulkhead ($4.6 million). This can be financed through cash flow.

4. FY93 REQUIREMENTS: Total capital requirements for FY93 are estimated at $14.205 million. Major projects include Locks Park ($.5 million for CPA share), channel widening and deepening project and paving the South Jetty and converting it into a fishing pier ($4.2 million for CPA share), and the start of construction of CT#8 and CT#9 and stabilization of the peninsula on the West Turning Basin ($9.0 million). It will be necessary to finance about $10 million in FY93 with the remainder paid from cash flow.

5. FY94 REQUIREMENTS: Total capital requirements for FY94 are estimated at $13.7 million. Major projects include completion of CT#8 and continued construction of CT#9 ($11.0 million), improvement of spoil site ADA 1A ($1.1 million as CPA cost share with the State of Florida), and design of CT#10 ($1.0 million). It will be necessary to finance about $10 million in FY94 with the remainder paid from cash flow.

6. FY95 REQUIREMENTS: Total capital requirements for FY95 are estimated at $13.155 million. Major projects include the completion of CT#9 ($6.0 million), completion of the bulkhead on the north side of the channel between the West and Center Turning Basins ($1.5 million), and the start of construction of CT#10 ($5.0 million). It will be necessary to finance about $9.0 million in FY95 with the remainder paid from cash flow.

a. With relation to cruise terminals, the above plans are based upon the assumption that all existing cruise terminals will be fully utilized or reserved for future utilization before construction commences on the next cruise terminal. Also, cruise terminals 8 & 9, as presently conceived, will be a double cruise terminal that shares common utilities and facilities. It will located in the middle of the north/south bulkhead on the west side of the West Turning Basin and will project into the basin in the form of a triangular pier that has a triangular cruise terminal building on it.

b. The Canaveral Port Authority recently was apparent low bidder to furnish berthing facilities for two MARAD ships for five years for $.328 million per year. Since this contract has not been finalized, neither the cost of building a finger pier and support dolphins for these ships for about $1.5 million nor the revenue which would pay for this facility has been included in any of the budgets. If we are awarded this contact, the budgets will be modified accordingly.

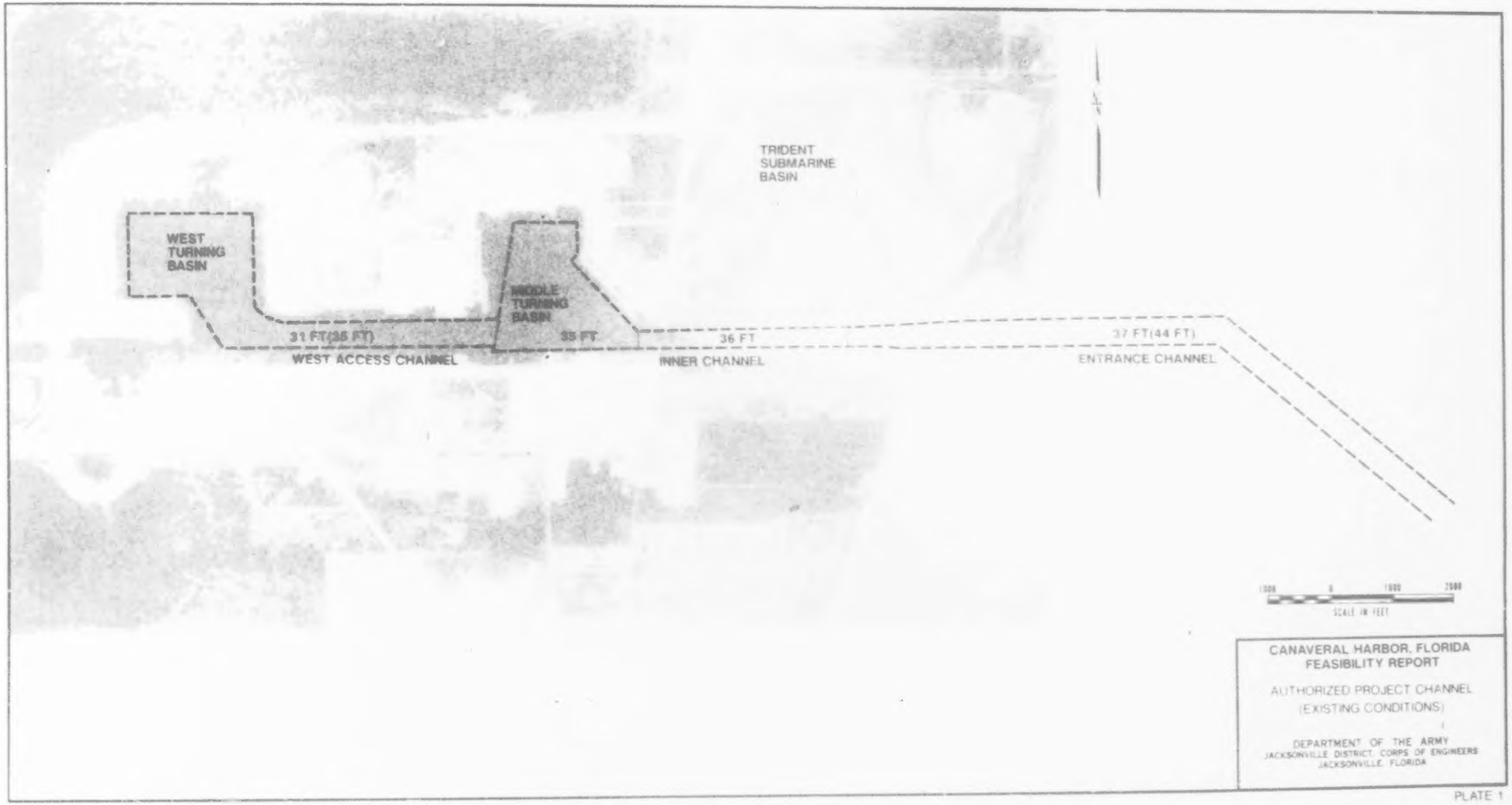
c. A new cargo pier south of TB2 will be completed in early FY91. Additional cargo piers have not bean programed during the five year period covered by this capital budget. Our staff is aggressively marketing the CPA's cargo facilities, and if we appear to be approaching capacity of existing facilities, an additional cargo pier or piers will be programed at that time. Such pier(s) will be financed from borrowing against the anticipated additional user fees.

(8/6/90)

CANAVERAL PORT AUTHORITY
CAPITAL BUDGET AND CASH FLOW PROJECTIONS
FY90 - FY95
(PROPOSED)

	CAPITAL PROJECTS (THOUSANDS)	FY90	FY91	FY92	FY93	FY94	FY95	TOTAL
1	Trans and utility corridor	90						90
2	WTB mitigation	55						55
3	Modify CT#2,3 & 4	710	200					910
4	Security fencing/guard shack	60	70	20	20	20	20	210
5	Maintenance dredging	54	100	50	50	50	50	354
6	Fire equipment	10	15	5	5	5	5	45
7	Fire truck payments		30	30	30	30	30	150
8	Improve piers, bldgs, struct	120	160	160	160	160	170	930
9	Road improvements	5	60	60	60	60	60	305
10	Paving turnout s. cargo area		160					160
11	S. industrial area land, utili	15	100	100	100	100	100	515
12	Office and minor equipment	20	30	20	20	20	20	130
13	Computer system	25	20	15	15	15	15	105
14	Landscape and rec. improve	800	250	100	500	100	100	1850
15	Communications equipment	5	5	5	5	5	5	30
16	Vehicles and equipment	34	60	20	30	25	20	189
17	Renovate piers	163						163
18	Land stabilization & drain	10	10	10	10	10	10	60
19	CT #5	6500	6133					12633
20	Impact fee CT #5 and #1	325	100					425
21	CT #1	220	3000					3220
22	CT #2,3,4 stretch/park lot	200	2021					2221
23	CT #2 add escalator		50	350				400
24	CT #3 upgrade escalator		200					200
25	CT #3 passenger ramps		150					150
26	CT #4 passenger ramps		300					300
27	CT #4 escalator		250					250
28	Channel wide & deep	56	180	140	4200			4576
29	TB #2 conversion & pol pipes	3000	1800					4800
30	IIF land swap/mitigation		230					230
31	Sand transfer facility	10	100					110
32	CT #8, 9 stabilize peninsula	20	100	1300	9000	11000	6000	27420
33	Cargo road & drainage	400						400
34	Office addition	120						120
35	CT furniture		80				50	130
36	Ro/ro pier 4N							0
37	Fishing fleet basin/tug pier	15		4600				4615
38	N. side bulkhead & dredge						1500	1500
39	Four lane George King	10	40					50
40	Spoil site ADA 1A					1100		1100
41	CT #10					1000	5000	6000
42								
43	TOTAL REQUIREMENTS	13052	16004	6985	14205	13700	13155	77101
44								

	CAPITAL PROJECTS (THOUSANDS)	FY90	FY91	FY92	FY93	FY94	FY95	TOTAL
45	Operating revenues	10504	12981	15500	18000	21000	24000	101985
46	Operating expenses	-5555	-6765	-8060	-9360	-10920	-12480	-53140
47								
48	Net operating income	4949	6216	7440	8640	10080	11520	48845
49								
50	State cost sharing		600	600		555		
51	Interest income	800	600	600	600	600	600	
52	Misc inc. (exp)			-10	-10	-10	-10	
53	Interest expense other	-3	-3					
54	Bond interest 1975A	-107	-104	-100	-95	-91	-86	
55	Bond interest 1975B	-171	-166	-161	-155	-149	-142	
56	Bond interest 1976	-91	-87	-82	-77	-71	-66	
57	Bond interest 1988	-588	-620	-620	-585	-550	-510	
58	Bond interest 1989		-320	-650	-600	-550	-500	
59								
60	Excess Revenue over Expenses	4789	6116	7017	7718	9814	10806	
61								
62	Depreciation	1800	2200	2200	2300	2500	3000	
63	Amortization	91	88	80	80	80	80	
64	Other non-cash outlays		11	10	10	10	10	
65								
66	Net cash from operations	6680	8415	9307	10108	12404	13896	60810
67	New financings	10000	7000		10000	10000	9000	46000
68								
69	Total sources of cash	16680	15415	9307	20108	22404	22896	
70	Beginning cash	5800	7966	3995	3153	2852	3328	
71								
72	Total cash available	22480	23381	13302	23261	25256	26224	
73								
74	Requirements	[illegible]	-18004	-6985	-14205	-13700	-13155	
75	Software	[illegible]	-7	-7	-7	-7	-7	
76	[illegible]	[illegible]	-88					
77	Bond principal 1975A	-50	-55	-60	-60	-65	-70	
78	Bond principal 1975B	[illegible]	-80	-85	-95	-100	-110	
79	Bond principal 1976	[illegible]	-75	-80	-80	-85	-90	
80	Bond principal 1988	[illegible]	[illegible]	-290	-800	-1000	-1200	
81	[illegible]	0	-700	-800	-1000	-1100	-1100	
82	[illegible]	[illegible]	-602	-744	-680	-600	-512	
83	[illegible]		-700	-700	-700	-700	-700	
84	[illegible]		-300	-533	-532	-400	-399	
85	[illegible]			0	0	0	0	
86	[illegible]			0	0	0	0	
87	[illegible]				-1000	-1000	-1000	
88	[illegible]				-850	-855	-760	
89	[illegible]					-1000	-1000	
90	[illegible]					-900	-855	
91	[illegible]						-900	
92	[illegible]						-855	
93	[illegible]	[illegible]	[illegible]	0	-500	-100	-110	
94								
95	[illegible]	[illegible]	[illegible]	-10149	-10069	-19927	-23161	
96								
97	[illegible]	[illegible]	[illegible]	200	100	100	200	
98								
99	[illegible]	[illegible]	[illegible]	3152	2852	3328	3261	

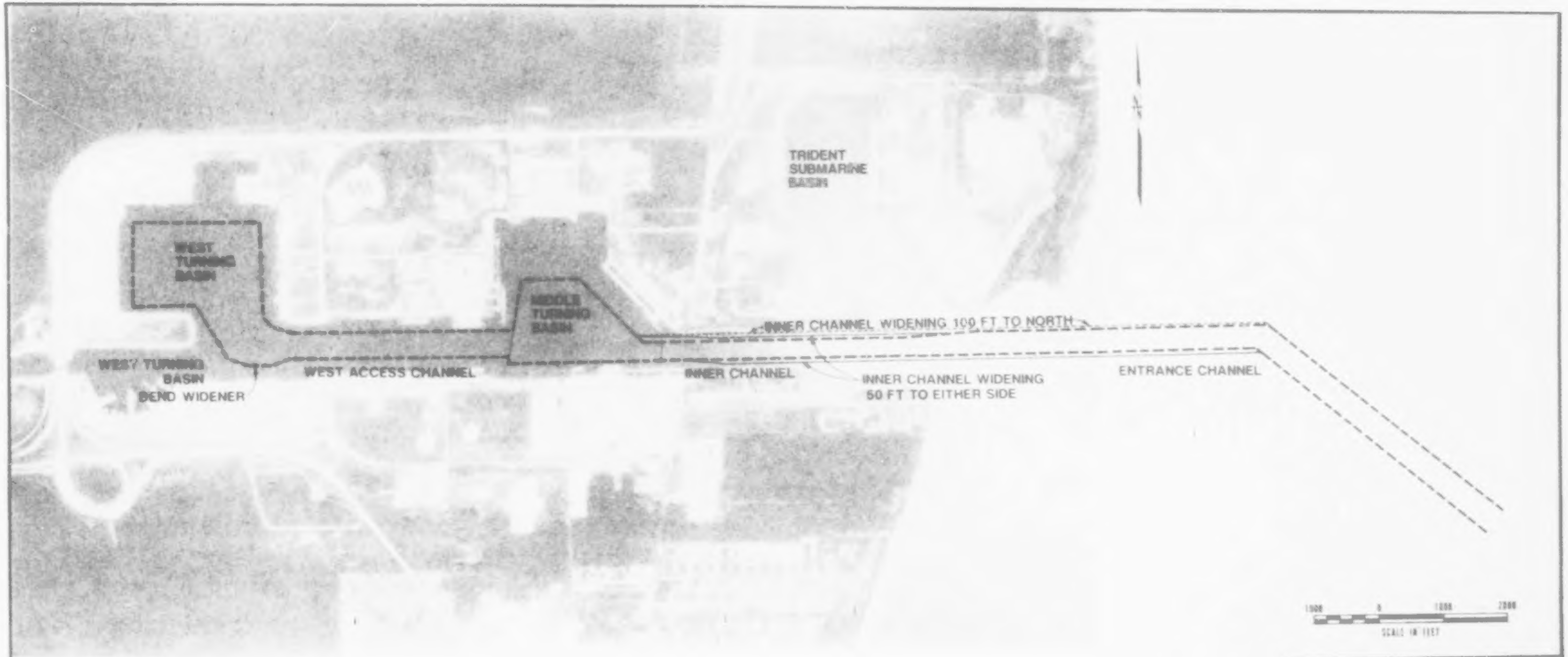

TRIDENT
SUBMARINE
BASIN
WEST
TURNING
BASIN
MIDDLE
TURNING
BASIN
31 FT(35 FT)
WEST ACCESS CHANNEL
35 FT
36 FT
INNER CHANNEL
37 FT(44 FT)
ENTRANCE CHANNEL
1000
0
1000
2000
SCALE IN FEET

CANAVERAL HARBOR, FLORIDA
FEASIBILITY REPORT

AUTHORIZED PROJECT CHANNEL
(EXISTING CONDITIONS)

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

PLATE 1

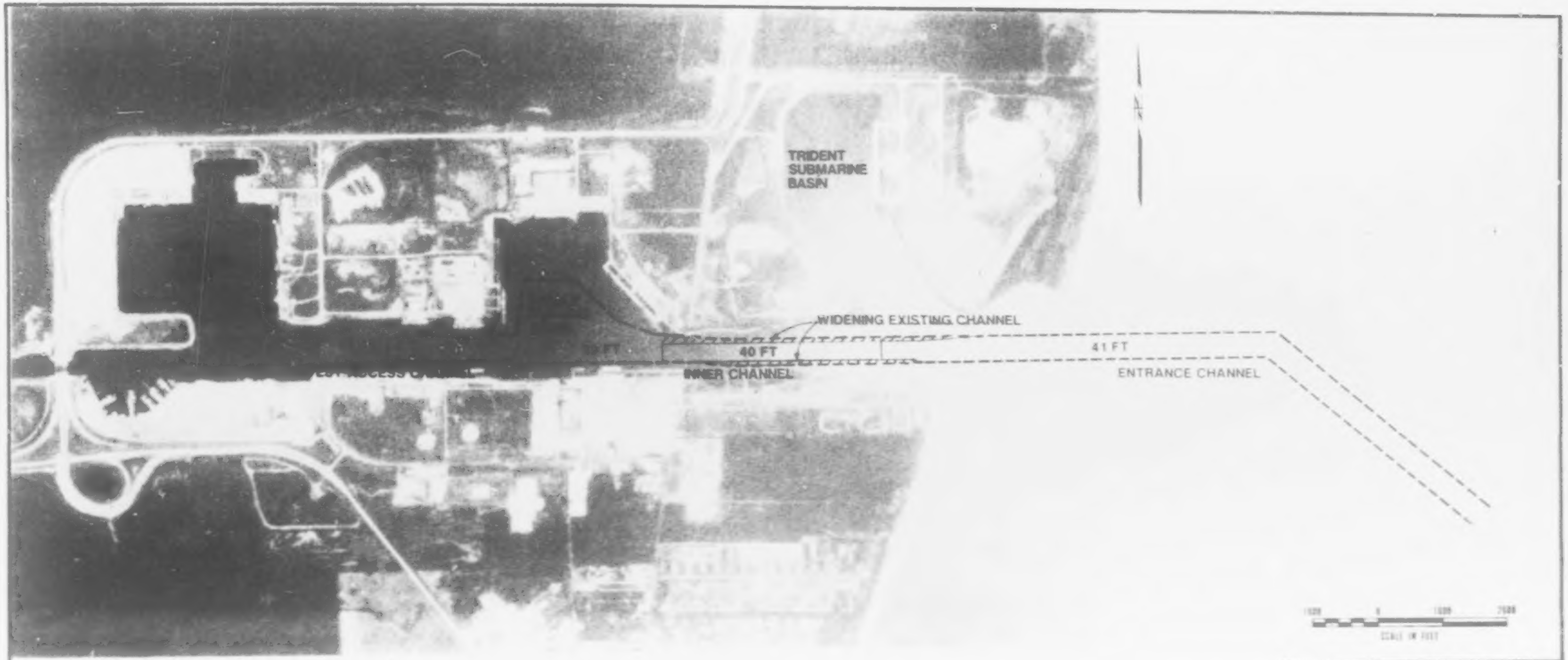

TRIDENT SUBMARINE BASIN
WEST TURNING BASIN
MIDDLE TURNING BASIN
INNER CHANNEL WIDENING 100 FT TO NORTH
WEST TURNING BASIN BEND WIDENER
WEST ACCESS CHANNEL
INNER CHANNEL
INNER CHANNEL WIDENING 50 FT TO EITHER SIDE
ENTRANCE CHANNEL
1000
0
1000
2000
SCALE IN FEET

CANAVERAL HARBOR, FLORIDA
FEASIBILITY REPORT

CONSIDERED IMPROVEMENT FEATURES

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

PLATE 2


TRIDENT
SUBMARINE
BASIN
WIDENING EXISTING CHANNEL
40 FT
41 FT
INNER CHANNEL
ENTRANCE CHANNEL
1000 0 1000 2000
SCALE IN FEET

CANAVERAL HARBOR, FLORIDA
FEASIBILITY REPORT

RECOMMENDED PLAN

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
JACKSONVILLE FLORIDA

PLATE 3